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The CoEVOLUTION Quarterly

"We have an unknown distance yet to run, an unknown river to explore. What falls there are, we know not; what rocks beset the channel, we know not; what walls rise over the river, we know not. Ah, well! We may conjecture many things."

—J. W. Powell

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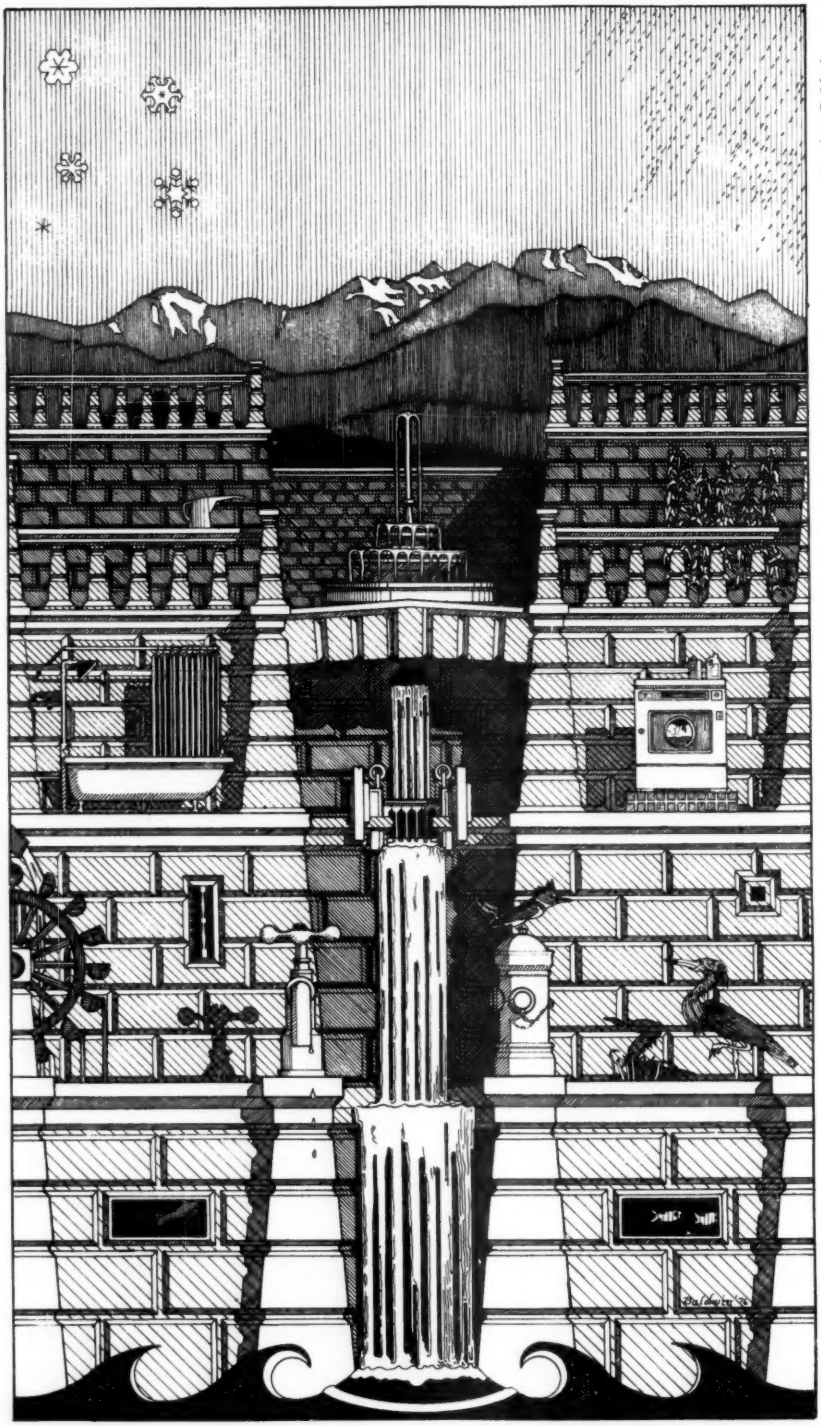

Gordon Baldwin

AS DARK BLUE

AND PINK

OF SKIES

REFLECTED IN AN EVENING MUDFLAT

show the shadow

of a kingfisher

flashing in

the mirrored ripples,

or as two dark eyes
stare across
a table
and for an instant
you forget
the thing
you are,
or as
a
YELLOW PANSY

when you discover

you are
A MAMMAL
PATRIOT.

These things

also are
the substrate

and the
chop

and
moil

of what we
swirl in.

—Michael McClure

The CoEVOLUTION Quarterly

Winter 1976-77

Watershed Consciousness

4 Introducing Peter Warshall, Watershed Editor for the next 90 pages

4-10 **Streaming Wisdom** *by Peter Warshall*

11-13 **Watershed Quiz**

14-21 **Watershed Form and Process: The Elegant Balance** *by Robert R. Curry*

22-24 **John Wesley Powell: Conscience of the Colorado** *by Peter Wild*

25 Powell's Classic ▪ Beyond the Hundredth Meridian

26-33 **Watershed Vignettes** *by Thomas Dunne and Luna B. Leopold*

34-35 **Another Watershed Vignette: Lake Tahoe, California** *by Peter Warshall and J.T. and Carin Winneberger*

35-36 Water, Earth and Man ▪ Water ▪ Water: A Primer ▪ Two High-Tech Books

36-37 Fluvial Processes in Geomorphology ▪ The Hydrologic Cycle and the Wisdom of God

37 Mystic Watershed: Out of Print ▪ Round River: from the Journals of Aldo Leopold

38 Watershed Planning: A Selected Bibliography ▪ Residential Water Conservation

38 A Guide to Air Quality Monitoring with Lichens ▪ Water Conservation

39 The Wetlands Project ▪ Guidelines for Stream Protection in Logging Operations

40-43 **Diagnosing Stream Health** *by Thomas Dunne and Luna B. Leopold*

44-45 **El Ranchito Los Pesares** *by Jaime de Angulo*

Forested Watersheds

46-49 **Forests and the Purposes of Man** *by Roy A. Rappaport*

50-53 **Douglas Fir Clearcut: The Fine Grain** ▪ Weed Tree

53 Access to Forestry ▪ The Citizen's Guide to Forestry and the Environment

54-59 **Headwaters: A Short History of a Backwoods Battle** *by Randal Lee O'Toole*

60-62 **Whose Trees? Whose Science?** *by Jack Westoby*

Turtle Island - 1976

64-69 **The Voices of Black Lake**

70-73 **Christo's Running Fence** *by Mike Alexander, Barbara and Paul Kayfetz, Peter Warshall*

74-77 **Healing the Land: The Redwood Creek Renewal Project** *by Gerald Myers*

77 A Return to People Powered Resource Production

78 Wood 'n Energy ▪ Protecting Creeksheds ▪ Reprint this book

78 The Florida Experience ▪ Housing for the Pequannock Watershed

79 Private Property and the Public Interest ▪ The Town That Fought to Save Itself

80-87 **That Which Makes You Move: A Conversation with Taj Mahal** *by Lewis MacAdams*

Uhrr upph't

89-91 **Interspecies Music** *by Jim Nollman*

92-93 **Access to Watershed Music** *by Peter Warshall*

93 The Mouth of the River: Concluding Notes

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Understanding Whole Systems

94-95 The Case against the Case for Mind/Body Dualism • The Promise of the Coming Dark Age
96-97 Ecological Considerations for Space Colonies

Land Use

98-99 Radical Agriculture • Secrets of Companion Planting
99 Organic Gardening in the West • Young Farmers' Homestead Act • Seed Money
100 Organic Gardening Under Glass • Liklik Buk • Maple sugar equipment

Soft Technology

101 Nature, Mother of Invention • Analysis of Vertebrate Structure
102-103 **From Urgencies to Essentials** *speech by Canadian Prime Minister Pierre Elliott Trudeau*
104-111 **The New Alchemists** *by J. Baldwin*
112-113 American Village Institute • The Solar Home Book • A Floridian's Guide to Solar Energy
114-115 Rain • Total Home Protection • EARS • Gaudi • Designing Houses • From the Ground Up
116 Geodesic Math and How to Use It • Fredson Trailer Supply • Bailey's Catalog

Craft

117 By Hand • Garrett Wade Company • Alfa Catalog

Community

118-126 **The Acorn People** *by Ron Jones*
127 Take Care of Yourself • A Consumer's Guide to Successful Surgery • Good Things for Babies
128-130 **I would like to write a silence** *by Anne Herbert*
131 Natural birth control • The cure for jet-lag • The best sexual lubricant
132-133 On references and sex • Estrogen Drugs: Cancer by Prescription?
134-137 **Odd Bodkins** *by Dan O'Neill*

Nomadics

138 McClane's New Standard Fishing Encyclopedia and International Angling Guide
138 Sherpa Snowshoes • Polarguard is fine

Communications

139 The Photography Catalog • House of Musical Traditions
139 Scientific Analysis on the Pocket Calculator

Learning

140 How to learn things • The Nature Company

Business

141-142 Statement of Ownership • Thank you • Profit/Loss • Subscription history
143-144 Big financial news • Financial report • Definitive fanmail • Gossip • Credits

Front Cover: *Christo's Running Fence. The Ribbon of Light between Esteros Americano and San Antonio watershed, Sonoma County, CA. Photos by Paul Kayfetz, lawyer responsible for obtaining Christo's permits.* **Back Cover:** *The Earth's Largest Watersheds, A watercolor by Arthur Okamura.* **Overall Background:** *Oceanic Currents, a line drawing by Arthur Okamura.* **Overall Cover Design** *by Bill Johnson.* **Inside Front Cover:** *"Watershed," pen and ink drawing, actual size by Gordon Baldwin.* **Poem:** *from unpublished manuscript "Antechamber" by Michael McClure.*

Streaming Wisdom

WATERSHED CONSCIOUSNESS IN THE TWENTIETH CENTURY

by Peter Warshall

"Although the river and the hill-side do not resemble each other at first sight, they are only extreme members of a continuous series, and when this is appreciated, one may fairly extend the "river" all over the basin and up to its very divides. Ordinarily treated, the river is like the veins of a leaf; broadly viewed, it is like the entire leaf."

—W. M. Davis (1899)

Introducing Peter Warshall, Watershed Editor for the next 90 pages

Sound local politics begins with watershed consciousness. That's true in Peter Warshall's town. It's true in your own.

Peter is 33. He grew up in Brooklyn amid the 50's gang scene, went to Stuyvesant High School ("the cream of the crap") in New York, entered Harvard at 16, and exited after two years in hot pursuit of his sanity, which he found somewhere between Paris and Greece, sleeping in old temples and along roadsides.

Back at Harvard a poker game with anthropologist Irven De Vore led to four months in Kenya, Africa, studying baboons — an experience that confirmed Peter's natural-history bent which had begun at the age of 12 when a duck he was watching through binoculars flew into the sun and never flew out.

While making the acquaintance of LSD borrowed from Timothy Leary's Harvard desk (this was '64) and people such as poet Allen Ginsberg, Peter was accepted for a Fulbright with anthropologist Claude Levi-Strauss in France, where he spent 18 months studying mammals and anthropology. Two more years at Harvard and Dr. Warshall got his Ph.D. in Biological Anthropology with a thesis on the group behavior of rhesus monkeys in Puerto Rico.

Up to this point Peter was moving toward the classical type (audubon, Muir, etc.) of the wandering naturalist who solves his human problems by always traveling on. Then in the Fall of 1970 he came to Briones, moved in with poet JoAnne Kyger, and took part in the transfiguration of the town by the great oil spill crisis of January 1971 (see **The Town That Fought to Save Itself**, *p. 79 in this* **CQ**).

Soon Peter found himself committed to the community via its water. Studying the likely effects of a proposed sewer plant on the local lagoon he helped write one of the first Environmental Impact Reports for the new Environmental Protection Agency. It became a model for other EIR's. Then he wrote and home-published **Septic Tank Practices**, *which became an underground classic (and now will be getting national distribution from Doubleday-Anchor).*

Peter makes his living doing odd projects as an independent watershed consultant, a guide at the Point Reyes Bird Observatory, and editing for **The CoEvolution Quarterly**. *A philosopher-king may or may not be a good idea. A scientist-artist-citizen surely is.*

—Stewart Brand, Usual Editor

Earth Exile From the Watershed

In Brooklyn, where I spent from age 3 to 16, there was an oft-heard tale: two boys sitting on the curb watching a pneumatic drill flake up pieces of asphalt. One says, "See, told you, that's where the City stores its dirt." Much later at the Green Gulch Zen Center Farm, I was trying to show a group of kids from an Oakland Panther school birds and plants. We walked through the garden and I casually picked a carrot. "Oh, man, that's Bugs Bunny's carrot."

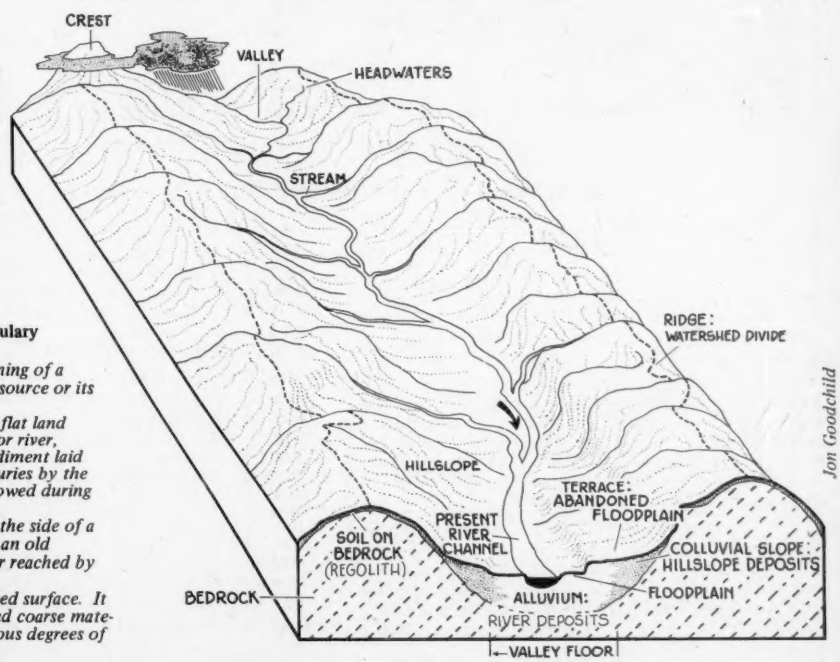
It took a half-hour to trace the carrot with its top to the packer who removed the top so the carrots would fit in plastic bags so the shipper could sell pre-packaged topless carrots to Safeway. (Then it was celery without roots, peas without pods, and brussels sprouts. . . .)

My life has been similar. As a child, my Eye had no ability to see land. Land was blocks, real estate with lines running through it with no sense of shape or contour. Water has been the liberator. Water is beautiful and ruthless. It will flow from one piece of property to another without a thought. It will erode or flood or carry nutrients anywhere – from cracks in public sidewalks to accumulated leaf mould on the White House roof.

The last ten years of my life, I have taken airplanes, driven cars and walked, healing my alienation from landscape. Discovering under the asphalt overlay that you can *see* the place you live in by following the ridges, the valley, the hills, the flow of water. The more I practiced in watershed perception, the more the disconnectedness of my mind, body, heart and breath to water, soil and other creatures was healed. Yosemite became my synagogue.

In 1965, I was hitch-hiking to LA. The man who finally picked me up kindly took me to his house so I could use the bathroom and call friends. It was night and I walked into the bathroom unable to find the light switch. A red glow came from the corner. It was the toilet lit from inside the bowl. I sat down on the seat and realized it was heated. (There was a jive version of the Iliad on the radio. "Achilles he was a mean dude." There were speakers in the bathroom.) I pulled the little chromium knob and the toilet absolutely silently flushed. This image came back when I started doing septic tank reconnaissance for the town I live in. By then, eight years later, I could write:

> As industrialization intensified, Western civilization became became more and more alienated from the body's plumbing and its connection to Nature's pathways. Instead of eating, defecating onto the ground, fertilizing plants with the feces, and eating again, we simply reach behind our backs and pull a little chromium lever. Instead of defecating into the earth, we sit on a toilet filled with good drinking water which comes from some unknown river and, after flushing, goes to some unknown destination. Instead of taking responsibility for our excrement, we are embarrassed by defecation and avoid direct discussion by substituting all kinds of diversionary vocabulary ("caa caa" and "poo poo" or abbreviations like "No. 1" and "No. 2" or sidewise expressions like "May I be excused.")
>
> Four events created our alienation from the circle of feces-fertilizer-food-feces. Piped water eliminated the out-house and bedpan and led to the invention of the flush toilet. The flush toilet itself allowed the Victorian flush-and-forget mentality to flourish. Modern medicine,



Jon Goodchild

Basic Watershed Vocabulary

Headwater: *The beginning of a stream or river. Its source or its upstream portion.*

Floodplain: *A strip of flat land bordering a stream or river, consisting of the sediment laid down over the centuries by the river when it overflowed during high floods.*

Terrace: *A plateau on the side of a valley, representing an old floodplain no longer reached by the river below.*

Regolith: *The weathered surface. It may contain fine and coarse materials displaying various degrees of mineral alteration.*

having conquered all the dangerous diseases caused by sewage, reduced the necessity to connect feces with the human body. Finally, the use of petroleum-based fertilizers temporarily broke the necessity of needing feces for growing food.

A sense of responsibility toward earth, air, water awakened in me. I ran for public office. I thought romantically of restoring people's belief in soil fertility – healing the somewhat schizophrenic mentality that transported fertilizers and fuel thousands of miles and isolated people from the stuff they lived off. I yearned to restore all the watersheds: heal the strip-mined land, heal the coastal estuaries, heal the clearcut forests, heal the overgrazed range land, heal the polluted salmon streams, heal the urban land use. I settled for the place I lived. A starting point. It's impossible enough.

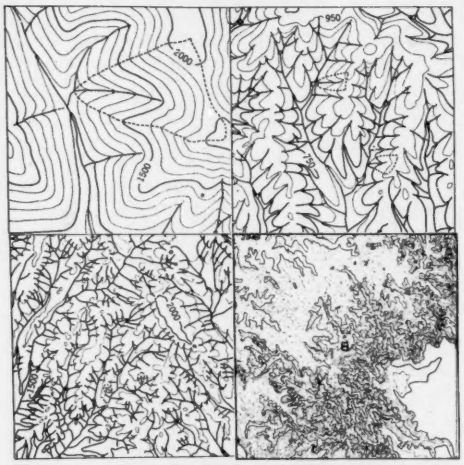
Watershed Consciousness

Watershed consciousness, the theme of this **CQ**, is a kind of Middle Way between Mind and Planet. Many of us have pursued an exploration of Mind, of inner consciousness as a Way to better well-being. Others have sought this same feeling by planetary vision, by seeing humans as one of the many wondrous creatures in the biosphere. Watershed consciousness is neither Inner Geography nor Whole Earth geography. It is a more local sense of place where the questions are not as abstract as "Will natural resources keep up with global population growth?" or "When is paranoia appropriate?" The questions are simple: where does the water come from when you turn on the faucet? Where does it go when you flush the toilet? What is the name of the land over which water flows past your home and into a creek or lake?

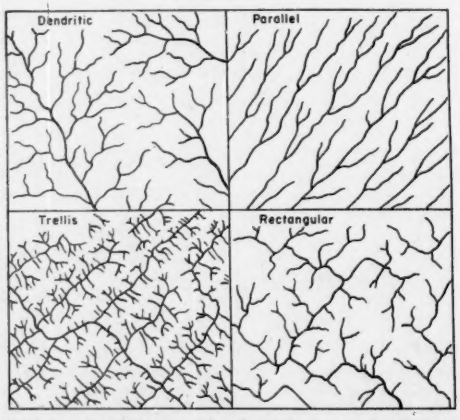
In this sense, watersheds are mini-biospheres of Earth and the first extension of Mind into the environment. Watersheds focus on the mixing of water and land, the process whereby landscape is moulded, soils are moved around and nutrients cycled to plants and us.

Watershed Form and Textures

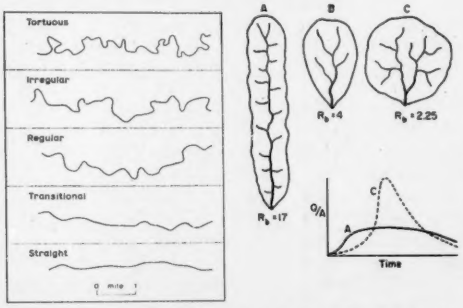
Last year, on the top of Mt. Tamalpais, I suddenly realized that it was all downhill from the crest. That all the creeks flowed from the mountain top in all directions. No great enlightenment but, as I sat, I wondered why the creeks didn't all go straight down the slopes like spokes of a wheel? Why the mountain seemed twisted in an east-west direction making one huge watershed and then lots of little ones? Watersheds were suddenly like flowers or birds or people with variety and mystery. I was hooked.



These networks can be closely packed or scattered and the density *of the streams in pattern will also adjust sediment to load. (Each box is one mile square.)*



Water passing from many headwaters to many headwater streams finally to the river crosses all kinds of rock and soils. These produce patterns *or* networks *which adjust soil and sediment to the passing of water*



The shape and pattern of the river in the valley *is a result of the land it's cutting and sediment it must carry. If the banks are soft, it will form a* floodplain *(see p. 5) that slows the water in marshes and side-lakes and reduces erosion as well as acts as a buffer to hillslopes so they can't be cut at the toe of the slope.*

The Basin linkages *of different size streams will also control speed of runoff as shown in the graph of a crest of a flood wave moving down watershed A vs. watershed C.*

The Meaning of Watershed

"Watershed wanders in meaning as Anglo-Saxon *sceadu* weaves multiple nuances in the history of English. All meanings came from the *parting* of hair on the human head, how it naturally *separates* and falls. As a verb:

to shed tears
to shed the past
to shed skin
to shed water like a duck
to shed leaves
to shed the blood of thy enemy
to shed thy Light on me!

The 19th century sense of watershed (*wasserscheide*) as used by Lyle and Darwin came from "parting" (of the flow) or "separation" (of the waters). It meant the boundary *line* that separated the flow of rainfall. In the U.S., we call this the DIVIDE. But, in England and Europe, watershed still means the line along the ridge which divides the flow of rainfall.

The Anglo-Saxon word (*sceadu*) also became "shade" (the parting of sunlight from darkness). Shade, sought for and found in light-built structures like lean-tos and arbors, transformed into SHED. *Sceadu* = SHADE = SHED, the slight building for shelter/storage as in:

wagonshed
woolshed
woodshed.

But sounds play on each other and nouns and verbs change hats. "To shed blood" became "bloodshed" – hardly a building. In the U.S. "to shed water" became WATERSHED, "to shed water over the surface of the land." In this sense, the hillslopes are like cheeks shedding tears into rivers that pour into the sea. WATERSHED was now the total *area* of waterflow on land, not just the boundary line dividing flow. This definition is still the most commonly found among scientists and is formally stated: "An area of land which drains water, sediment and dissolved materials to a common outlet at some point along a stream or river." Used in this way, it is synonymous with DRAINAGE BASIN (following the French) or, in other countries, CATCHMENT AREA.

But, the noun WATERSHED kept tripping on its connection to the shelter SHED. In its most recent blossoming, WATERSHED is almost a domicile, a mini-biosphere with walls of hills and mountains; a floor of river or lake; and a roof of rain clouds. This is a flowing structure where clouds part with rain which enters and erodes the walls into the aquaeous floor which evaporates back into the roof. This WATERSHED is more in touch with the endless, moving Form, the Water Cycle flow.

Watershed Way

In ancient China, there was a profession called a "geomancer," literally an Earth Diviner. He had a metal disc inscribed with astronomy and water signs. He placed the disc on a magnetic stone and from its orientation read the "lines of force" that stretched across the landscape. Some of the most beautiful Chinese villages and towns were designed by geomancers who set houses in places needed to concentrate energy or disperse it.

There is nothing weaker than water
But none is superior to it in overcoming the hard,
For which there is no substitute.
That weakness overcomes strength
And gentleness overcomes rigidity,
No one does not know;
No one can put into practice.

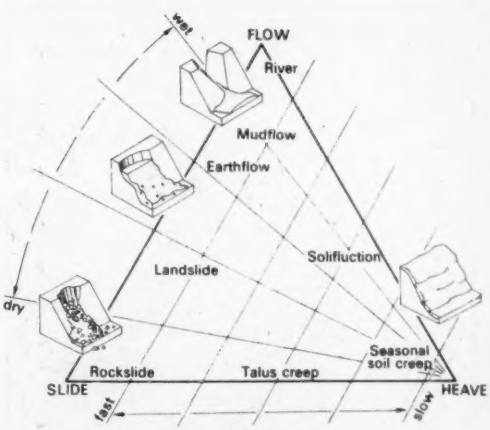
–Lao Tsu

Modern scientists interested in watersheds vary from regional planners, geologists, meteorologists, forestry experts, ecologists – but we still have not become "geomancers." While space physics may be sophisticated, it is only recently (the last 20 years) that naturalists have tried to become more sophisticated about the watersheds we live in.

The Watershed Way has two energies: the energy of gravity and the energy of the sun. Water and Land follow gravity down to the sea. The Sun returns the water to the Sky by heating it up and gravity returns it to Earth. The Earth returns the soil back to the land by uplifting and volcanoes.

Water and soil are never lost as they cycle. They only change position. Energy, though, is lost as friction of water and sediment shearing the river channel walls or as heat used up to change liquid water to vapor and in other ways.

[more →]



The Slide, The Flow and The Heave

During mass movement of hillslopes, the particles of earth remain a coherent whole. The slide *moves like a brick down a chute. The* flow *moves like a liquid. During the* heave, *soil expands and contracts perpendicular to the surface. Frost causes roads to heave. Not shown are particles (vs. mass) movements. Here individual particles move with little relation to their neighbors. Rain splash, surface wash and particles moving in solution (colloids) are examples of this smaller scale hillslope erosion process.*

The Watershed Way means looking at landscape, looking at water as it exists in landscape. There are many views. *Think and see like water:* the hillslopes and river are just two kinds of pipe water must pass through on its way to the sea. The soil is a sieve, the river an open channel. Plants, people, ponds and lakes are just temporary storage containers. *Think and feel like soil.* The hillslopes and rivers are just two ways to wash away debris: the hillslopes by erosion (overland flow); the river by transporting sediment. Floodplains are just temporary storage for soil.

From the hillslope view, form is changed by wind and water. Water moves hillslopes in massive ways – by slides, by heaves, by flows of rock and earth. Water also moves soil as particles by rainsplash, surface wash and underground liquid solution. Water loosens rock and soil by *weathering* (dissolving and cracking during freezing). If water doesn't wash weathered material away faster than it can be made, then soil accumulates – a change in hillslope surface.

From the river view, Form is changed by the amount of water coming from the rain and hillslopes, the

"After the rains, the mountain stream at the bottom of the valley can be heard all night. It is not pushed from behind but falls with gravity. Heard from a distance it sighs; close by it bubbles and chuckles, hisses and gurgles. Whirligigs stay in the same places with very slight variations of pattern, but the water goes on and on."

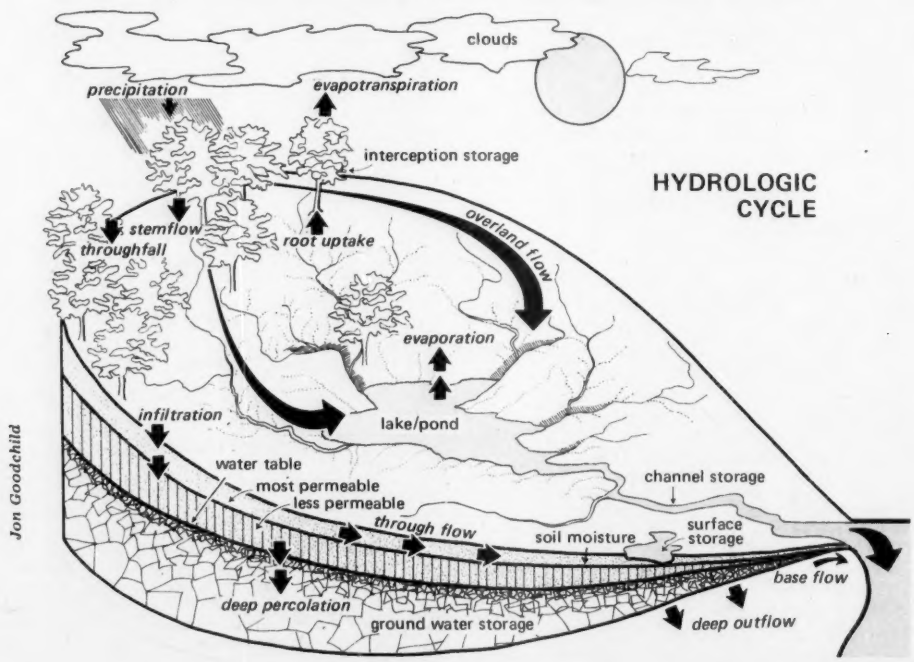
–Alan Watts, The Water Course Way

burden of sediment the river must transport and the kind of land the channel is cutting. If the hillslopes can do it, a river "prefers" a constant yearly flow of water. Not a seasonal flood, then a drought. A river can keep its Form better if the hillslope maintains its own.

Earlier this year, I went with Bob Curry (see "Watershed Form and Process: The Elegant Balance, p. 14) and others on a twenty-mile hike along a potential logging road by the Eel River. The Eel is the fastest eroding river in North America and we were particularly worried about the summer-running steelhead

Water endlessly circulates from ocean to atmosphere to earth to ocean to atmosphere. . . . During circulation, it is temporarily stored *in streams, lakes, the soil, groundwater, plants and animals. Starting in the sky, rain or snow or hail (*precipitation*) descends to earth. Some is stored on leaves (*interception*) and short-circuited back to the sky (*evaporation*). Some flows off the leaves (*throughfall*) or down the trunk (*stem flow*). On earth, rain is absorbed (*infiltration*) and is stored as* soil moisture. *If soils are saturated, the rain fills depressions and begins to run downslope (*overland flow*). Soil water may percolate deeper to* groundwater *or move through the topsoil to streams (*through flow*). But, the sun's heat returns some rainfall back to the sky by* evaporation *from topsoil and lakes and by* transpiration *from plants. Water in the sky is stored in clouds.*

Stored water is printed in this type face. *Flowing water (down or up) is printed in this type face.*



Jon Goodchild

trout that could lose their spawning grounds in sediment. Bob was equipped with the tools of the twentieth century geomancer: Brunton compass (pocket transit) and USGS topo maps. On the walk and in Bob's presence, I began to understand that watersheds not only had personalities, but they were bodies, sentient beings of sorts, that tried to use their parts to keep the whole (hillslope/river) in balance. The streams were like a nervous system giving early warnings of a hillslope falling apart. The headwaters were like the mind: a subtle place high on the hillslope where the water tasted clear and pure almost like rainfall; where the hillslope suddenly opened up to start the river; where peace was needed because any change at the headwaters would be felt all the way downstream; and where the bare rock tributaries provided minerals to be used and stored downstream.

The whole attitude of land seemed to be: Delay the water from passing through. Slow it down by making it run underground or snaking the river shape. Create lakes and bogs and marshes in the flood plain. Slow it down and hold so the hillslope can keep its shape. Water just does what it does and pays no mind.

Watershed Life

Nurtured by a balance of hillslope form and river form, most watersheds can build up soils. These soils are the cradle of plant and animal life. They add a whole new dimension to the watershed balance: chemical exchange.

Life gets complicated, as they say, and water passing through soil and soils travelling in water just won't explain it all. Enter a combo-cycle in which the Water Cycle and Soil Cycle become a huge, scientific conglomerate: the Bio (LIFE) - geo (EARTH) - chemical (COMBINED ELEMENTS) cycle.

[more→]

*The Biogeochemical Cycle binds living creatures through water/soil/plants/atmosphere into one dependent web. From the sky comes chemical compounds in rain or dust (*precipitation, fallout*). Leaves absorb some and rain washes some away (*leaf absorption, leaf leaching*). The dissolved chemicals in the soil or in the ponds and lakes are stored or flow into plants (*uptake*) which are eaten by animals (*ingestion*) and flow out of animals (*excretion*) sometimes changed, sometimes the same. Some dissolved compounds* percolate *into deep soils or rock and temporarily drop out of the biogeochemical cycle. The percolating water combined with gases (oxygen and carbon dioxide), organic acids and other compounds reacts with rock to add dissolved chemicals to the cycle (*weathering*). The cycle is balanced without total reliance on weathering because chemicals are transformed from one form to another by bacteria (*decay *and* digestion*) and microbial use of the atmospheric gases (*fixation/release*) and* lightning. *The water cycle acts as transporter and storer of chemicals (gases, minerals) in their aqueous phase.*

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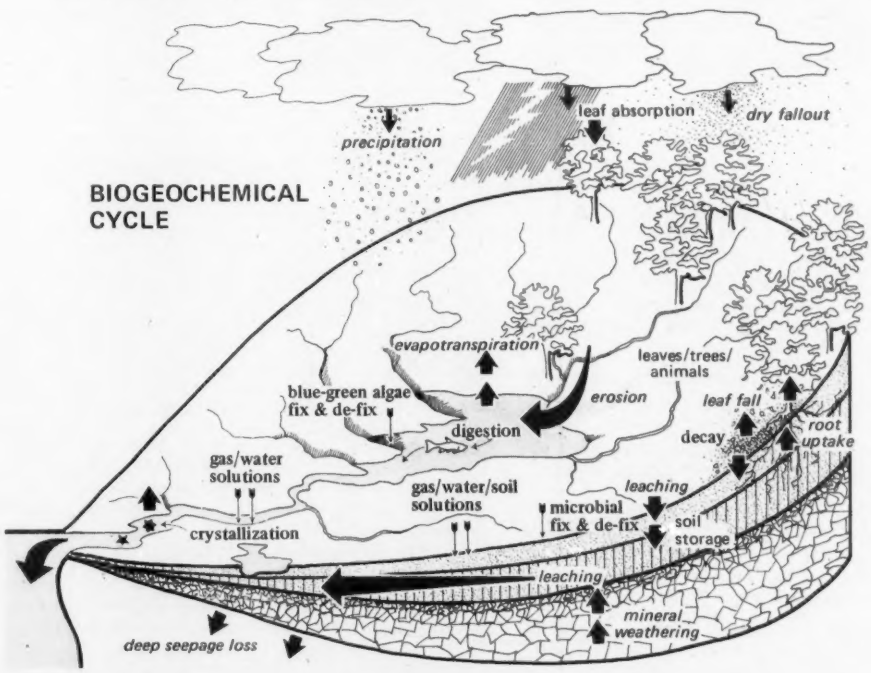
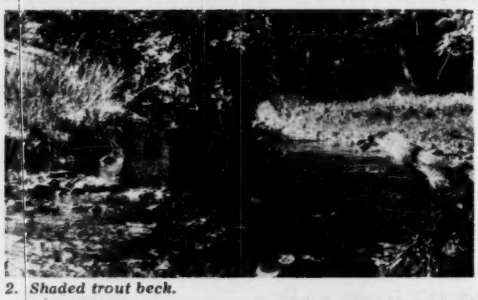


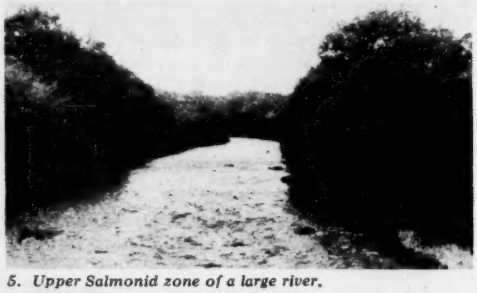
Jon Goodchild

1. Head stream.

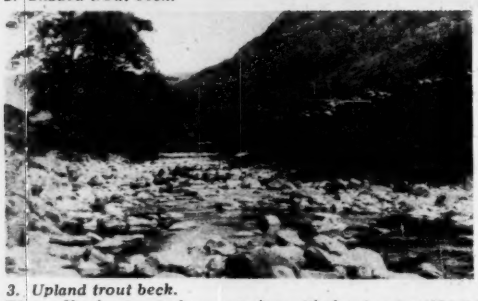
4. Minnow reach.



2. Shaded trout beck.



5. Upper Salmonid zone of a large river.



3. Upland trout beck.
River: Headwaters to lower reaches with dominant resident fish.

6. Lowland river, upper zone (Chub or Barbel).

It all started in 1966 when Dick Martin, a botanist-saxophone player, invited me to move into a cottage near some cranberry bogs close to Buzzard's Bay, Massachusetts. Dick and I took late afternoon walks down to the bogs and we would watch the sunset and hear the first voices of pickerel frogs and the slowing down of crickets. We watched the floating cranberries in winter get frozen into the ice, turning the surface a spotted red and translucent white. Pretty in an orange sunset.

Dick loaned me his copy of Chuang-Tsu, a Taoist humorist-philosopher and later the **I Ching**, a Taoist postscript. These books melded with the seasons. The lines (yielding or resistant, empty or full, flowing or contained) paralleled aspects of water (liquid or ice, valley or lake, rainfall or subterranean well). The hexagrams added lines that change from one form to another – the so-called moving lines. The possibilities of combinations and subtleties of 64 hexagrams, all possibly changing shape, seemed overwhelming and diverse. They seemed like the chemistry I was studying, like the food web. They were my introduction to the Biogeochemical Cycle.

Water makes soils, soils make trees that shed leaves into streams that fungi decay that insect larvae eat who are, in turn, eaten by fish. The fish eventually die and decay, returning the chemicals to water solution that may find its way downstream to the floodplain where they will fertilize plants again. Like water and soil, nutrients are never lost. They just change position *and the elements change their compounds.* Chemical transformation takes place in the sky by lightning; in the soil when organic acids react with other chemicals; in plants, especially bacteria and blue-green algae that can use atmospheric nitrogen; in animals that eat food and process it in their stomachs.

When the total watershed remains in physical balance, nutrients like water and soils are detained longer on land. The soils, in certain climates, build and retain more moisture further detaining water and, simultaneously, encouraging Life. The built-up soils have increased nutrient storage sites and the biogeochemical cycle loops more, keeping the chemicals as richer lingering life before, like everything, we stream on out to sea to sky to land to sea . . . .

Watershed Quiz

- *When you turn on your faucet, where does your water come from?*
- *When you flush your toilet, where does the water go?*
- *When rainwater flows past your home, what creek, lake, or river is it flowing toward?*

PAUL KRASSNER

Editor of **The Realist**

Krassner: You just want stuff off the top of my head?

PW: Right, exactly.

Krassner: Rather than off the side of my knee?

PW: When you turn on the faucet, where does your water come from?

Krassner: Where does it come from? Do you mean which reservoir?

PW: Well, ok. What rivers, something like that.

Krassner: It comes from my naive sense of trust.

PW: I know what you mean.

Krassner: I mean, as long as you're asking a lot of people, I guess that's my answer. It comes from my naive sense of trust.

PW: That's a fine answer, actually. When you flush the toilet, where does it go?

Krassner: I never flush my toilet.

PW: I see. Well. When it rains, do you know where the water's draining to? Do you know where or what your drainage basin or watershed might be called?

Krassner: Downhill.

PW: Finally, do you think these are important questions?

Krassner: I think they're basic questions and I'm glad you're asking them. I was at a Tubes' concert recently – they're the ones who do that song, "Whaddya Want From Life?" – and they started asking everybody that question. Steve Weibel came over to my table and said, "What do you want from life?" My immediate response was, "A question." So you've done your good deed for the day, treblefold.

□ □ □

WENDELL BERRY

Poet, farmer, author of **The Long-Legged House, The Memory of Old Jack; A Continuous Harmony; Farming: A Handbook**

WATER DESTINATION: We only use the toilet for convenience on winter nights, and the rest of the time we use a privy. That makes compost, and that goes on the plants. But our toilet goes into a septic tank, and then bath water, dish water, stuff like that goes into a septic tank, and then out into a tile, which doesn't work too well, and I suppose eventually into the Kentucky River.

PW: I see. How far are you from the Kentucky River?

Berry: Not very far. 450 yards maybe.

PW: So most of it probably even gets absorbed by plants before it gets there.

Berry: Yes. At no time of the year that I know does the water, or any effluent from the septic tank, run directly into the stream.

It's hard to ask simple straightforward questions these days. Margaret Mead simply said: "They're no fun . . ." and, finding it awkward myself, I easily agreed. Carl Sagan just moved into a new watershed and didn't want to answer. Your watershed is a kind of address. He was worried about "privacy." I tried to get ahold of most of the contributors to the Space Colony issue but found Bucky Fuller in Thailand and Ken Kesey "out back some place." Worse, was the problem of tape recorders. Ours buzzed Luna Leopold's thorough and wise response into incoherence. So, here are the solid citizens who tolerated my "quiz show" bludgeoning, thinking of their body plumbing and how it connects with the Water Cycle of Earth. —PW

YOUR WATERSHED'S NAME: I live in the Kentucky River Valley.

ARE THESE IMPORTANT QUESTIONS? You bet. I mean, I'm in a kind of a unique situation. I can look out my window and see the river where my water goes. It's all kind of tied together.

PW: It is. But it becomes more of a question in cities where people have about four connections between three different reservoirs and they're pumping ground water. It's almost impossible for them to connect their body plumbing up to their natural plumbing.

□ □ □

LYNN MARGULIS

Microbiologist, author of **Origin of Eukaryotic Cells,** *co-deviser of the Gaia Hypothesis*

WATER SOURCE: Well, the water for all the Boston area comes from the Quabbin Reservoir, which is in West Central Massachusetts.

WATER DESTINATION: It goes out through a series of pipes that end up in the Deer Island Sewer Treatment Plant, which is right off Winthrop, Mass., so it's just a couple of miles off shore, but it's connected to the shore by a bridge.

PW: Do you know what kind of treatment it has?

Margulis: Well, Deer Island . . . is tertiary complete, or is it primary?

PW: The most complete is tertiary.

Margulis: Well, it's a tertiary sewer treatment plant, but it overflows occasionally. It serves something like 3,000,000 people: all of the city of Boston, most of Billerica, and all the highly populated suburbs. It runs into overflow, and often is forced to dump raw sewage into the ocean.

YOUR WATERSHED'S NAME: The water runs eventually into the Charles River, which is the drainage basin for most of the world directly west of Boston.

PW: So if there weren't storm sewers it would probably go directly from your house into that river.

Margulis: Yes, which is very close.

ARE THESE IMPORTANT QUESTIONS? Yes. We do a tour in Botany where we take the students to the Deer Island Sewer Treatment Plant. It's a big eye opener to them. They go through the microbiology lab, and they get some idea of the testing that goes on. It's not too bad around here, but all the money for education in the water and sewage treatment area has disappeared in the last few years. They used to have a regular tour through the sewer treatment plant, but now we have to plead to go. Furthermore, I was told by a public official in the town we used to live in, Watertown, that all the sewage is dumped into the ocean, "but it doesn't matter because everyone knows bacteria can't live in the ocean." This was a public official, and he really believed that that was the case. He told everybody. So of course I think everybody should know.

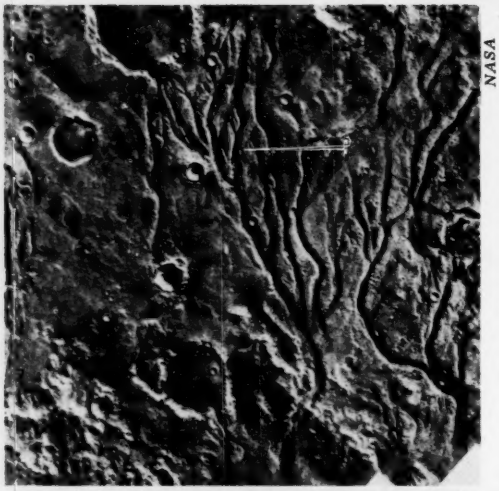
Is that all "watershed" means? I thought it was something fancy.

PW: Basically the watershed is just a way of looking at the drainage basin. It's also a way of looking at the biochemical cycle – you know, how the soils and water work together. So, no, it's nothing too fancy.

Margulis: Well, I thought it was some political movement.

PW: Not really. But there are a lot of people now who are into what they call watershed government, which is an attempt to organize the government by the drainage basins, so that if someone does something upstream, the people downstream can have something to say about it, or vice versa. In that way it's become politicized.

[more ➔]



NASA

A watershed on Mars. When flooding, the river cut through some old meteorite craters but also was hit by new meteors after flooding stopped. Headwaters unknown.

STEWART BRAND

Editor, **CoEvolution Quarterly**

WATER SOURCE: I'm not sure. Oh, I think I know cause I was up on the mountain. It's those lakes on the far side. *[SB is referring to Mt. Tamalpais, Lagunitas Creek and three dams along the creek.]*

WATER DESTINATION: Well, I piss right over the side into the Bay . . .

YOUR WATERSHED'S NAME: Well, the Bay Area, I guess.

PW: Anything smaller? That includes the Sacramento and San Joaquin. Since you're so close to shore, it must be a small, intermittent stream or something. . . .

ARE THESE IMPORTANT QUESTIONS? Yes, I do think it's important. For the same reason I think it's important to know the phases of the moon or where North is. There is a kind of person who is always concerned with knowing where the sun is. They can usually read north from the shadows on photos. It is fine grained sense of wisdom, and it's good behavior.

□ □ □

GERARD O'NEILL

High energy physicist, architect of Space Colonies

WATER SOURCE: It comes from wells, which are in Princeton. The whole town runs on well water.

PW: Amazing. There are a lot of people in Princeton, aren't there?

O'Neill: Thirty thousand.

PW: And they can all get the well water?

O'Neill: Yes. There are about four or five main wells. It's a city water system, that all runs off those.

WATER DESTINATION: It goes to a sewage processing plant, and the water, after processing, eventually ends up in the Delaware river, and then Chesapeake Bay.

YOUR WATERSHED'S NAME: Streams where we are flow into the Raritan river, which flows into the Hudson River by Manhattan. If we were a mile or two the other way the water would go into the Delaware.

ARE THESE IMPORTANT QUESTIONS? It's not clear to me that it's important for the individual citizen to know that, but I'm willing to be argued into it. It would seem more crucial to know the answers if you're living in Southern California and your water comes from the Colorado River.

JOHN HOLT

Author of **How Children Fail, How Children Learn, What Do I Do Monday?**

WATER SOURCE: Boston has a reservoir system not too far out of town in the western suburbs. The river that goes west from Boston is the Charles, but the Charles is pretty dirty. We don't get drinking water out of the Charles. We get it out of a bunch of different ponds and lakes, and I don't know which ones.

WATER DESTINATION: Out in Boston Harbor, but I don't know how far out. As far as I know of we don't have any municipal sewage treatment like Chicago. In all the years I've been here, I've never heard any talk about where that plant is or what it does. I really don't know.

YOUR WATERSHED'S NAME: Well, I live down at the bottom of Beacon Hill. Oh, that water goes out into the Charles River. You know, storm sewers.

ARE THESE IMPORTANT QUESTIONS? Yeah. We have pretty decent drinking water, actually, compared with most big cities.

□ □ □

RUSSELL SCHWEICKART

NASA Astronaut (Spacewalk, Apollo 9)

WATER SOURCE: I don't know. I mean, I can tell you it's the Arlington County water system, but I can't tell you specifically where the Arlington County water comes from.

WATER DESTINATION: It ends up in the Potomac. The water is treated before it gets there, but I don't in all honesty know whether it's tertiary treatment or secondary, or what.

YOUR WATERSHED'S NAME: I can tell you that, but I don't know if it's the formal name of the watershed. It's Windy Run.

PW: What does the Windy Run connect to, do you know?

Schweickart: The Potomac.

PW: So it's like a tributary of the Potomac or something.

Schweickart: Well, it's a runoff into the Potomac, anyway. It's a brook. In fact, although the natural runoff is Windy Run, I think our storm drains by-pass it, and go directly into the Potomac because we're within a half mile of the river.

ARE THESE IMPORTANT QUESTIONS? Well, I think certainly the first two are. The last one I think certainly would depend a great deal more on the particular relationship between the watershed and the detailed water supply situation in the area. In some cases I think that might be an important thing, and in other cases, it probably isn't.

□ □ □

GREGORY BATESON

Anthropologist, cybernetician, and author of **Steps to an Ecology of Mind**

WATER SOURCE: It comes from a well about a hundred and fifty yards below my house, and a pump raises it from the well.

WATER DESTINATION: Ah. When the toilet flushes: now that's more difficult. I can tell you what my suspicion is. That it goes direct into the well. It smells like that, the well does.

PW: My gosh.

Bateson: Well, we try not to drink it. We drink water from Crystal Springs Water Co. They have a spring somewhere up in the top of this entire grade region, I'm not quite sure where, and no doubt they'll go dry soon.

PW: So your water, when you flush the toilet, goes into a septic tank or something?

Bateson: It goes into a septic tank and through that into the well, I take it. It doesn't go direct into the well, no.

YOUR WATERSHED'S NAME: The water runs over on this side into the San Lorenzo valley and into the San Lorenzo River. There is also a dam. The Corp of Engineers dammed something and called it Loch Lomond. We're in Ben Lomond,

and Loch Lomond, which contains quite a lot of water actually, is a sort of reserve supply for Ben Lomond, I think. I don't know really where Loch Lomond goes to, mainly. I'm told we don't use it all the time. I suspect the main supply feeds into Santa Cruz, probably.

ARE THESE IMPORTANT QUESTIONS? Ummm. Yes. I'm inclined to think people should know the answers to them. I think there are a lot of such things they should know, besides the water cycle. I think they should know that their energy comes from their food, for example. I think they should know that they make the images they see, you know, that when you look at me and you see this pretty brown thing with a pink blob at one end and a brown middle, then you made that picture. And a lot of things like that are not taught. Right?

PW: The question that no one has really been able to answer is where their electricity comes from.

Bateson: Where our electricity comes from? Ah. That I do not know. That's correct. We know that on the East coast they had this fantastic blow out in which practically all the power from New York to Montreal went.

PW: I think out here a lot of the water that is used hydroelectrically comes from the Feather River and there's some stuff that still comes from steam production, too.

Bateson: We don't yet have an atomic plant feeding us with electricity.

PW: Well, there is one.

Bateson: There's one in Morro Bay isn't there? That's only 60 miles south of here.

PW: Right. So that may be the supply for Santa Cruz. Anyway, the question of our sources of electricity always stumps everyone.

STEVE BAER

***Inventor, president of Zomeworks, author of* Dome Cookbook, Zome Primer, *and* Sun Spots**

WATER SOURCE: Well, it comes from our windmill, about 20 yards northwest of our house. It comes from the gravel right there, and then the Rio Grande basin.

WATER DESTINATION: It goes to a septic tank right southwest of our house. We have a septic tank and a leach field right below a berm. Last summer we had to flush the toilet about every other time, because the wind dies down in the summer, and we don't get as much water. We were really getting pinched in the summertime. Everytime a kid goes wee wee, there goes another five gallons of water: it's ridiculous. I try to get them to go outside and piss on the ground. I spent all summer being uptight about water use. When the water goes down, I can't water the garden.

YOUR WATERSHED'S NAME: The Rio Grande. We're on a gully that washes out of a trailer court that was recently built out of the road. Yeah. That's where we are. We're on the Rancho West Trailer Park's watershed. It washed out our road last year.

ARE THESE IMPORTANT QUESTIONS? You're damn right they're important. I just got halfway through making a little solar still here in town, that we're going to use cause the water's so awful. On the back page of the Mother Earth News Linus Pauling says the water we drink is simply diluted sewage.

PW: Do you chlorinate your own drinking water?

Baer: God no.

PW: What does your ground water taste like?

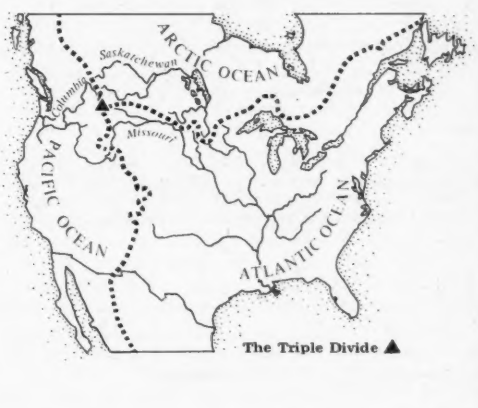
Baer: It's great. We have really good gravel, so our ground water is good. ■

North American Watersheds and Seasons

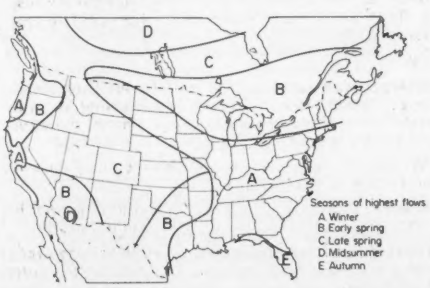
At Triple Divide in Glacier National Park are the headwaters of three of North America's largest rivers. Flowing north into Hudson Bay and the Arctic Ocean are tributaries of the Saskatchewan. Flowing southeast are the feeder streams to the Missouri and Missippi, which empties into the Gulf of Mexico. Flowing west are the feeder streams of the Columbia which empties into the Pacific. Here is one ridge of the Rockies forming the boundary line for three giant watersheds of North America. As Stewart Brand said: "A man could stand in one place and turn while pissing into three oceans of the Earth."

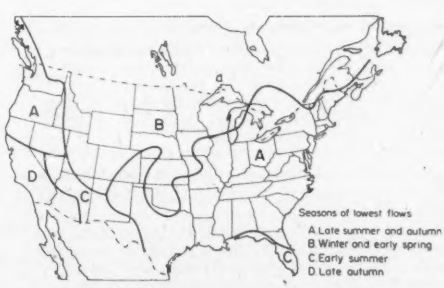
•

In the northeast, rivers are conceived in winter; born with the spring melt, overflowing and flooding the land; matured by late summer, returning to its inherited channel where it goes to sleep by late fall, hibernating as the snow arrives. But, these seasons are not for all watersheds and Euro-Americans have a hard time dropping their temperate vocabularies and finding their local seasons. So, the southwest has two springs, California is winter wet/summer dry . . . and watershed life-cycle means where-you-live. —PW



The Triple Divide ▲





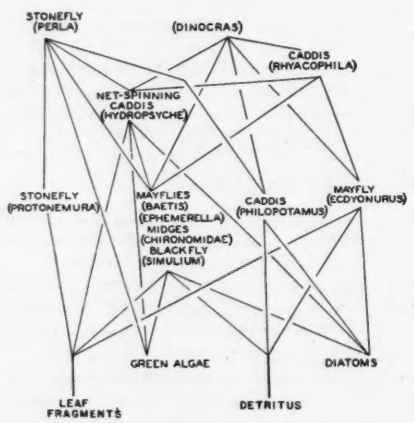
Watershed Form and Process
The Elegant Balance

BY ROBERT R. CURRY

All of Earth is a manifestation of energy flow and ordering. The fundamental difference between organisms and non-living things is that living things can store and convert energy and can order its expenditure at times different from when it is received.

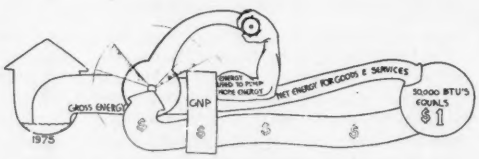
The stone cannot convert the sun's energy to carbohydrate and thus save that energy for later release during the coldest part of the night. Similarly, the potential energy of each drop of water cannot increase after that drop falls to the ground. It can remain constant momentarily in a lake or glacier but can only run downhill, decreasing its solar-derived potential energy while expending kinetic energy as work within the watershed.

Both the living and inorganic (rocks, soil) components of the earth's surface make up a single open thermodynamic system. Together, they are bound together as the pathways and equilibria of energy flow at the surface of the earth. Energy utilization by living parts of the landscape and the energy and material pathways in the non-living parts of the landscape are the essence of watershed science. In watersheds, nutrients and materials cycle through many inputs of solar energy while landforms are shaped by one particular kind of solar input – running water. In summary, despite the different ways energy moves through and is stored by rock, soil and life, they are all inextricably bound by the sun-driven cycle of water and by thermo-dynamic laws.



Watershed vs. Ecosystem Thought

Watersheds have rarely been used as natural conceptual boundaries for ecosystems. Ecology as popularly perceived has focussed primarily on the biological end of the spectrum. Watershed science is the study of the biological and geochemical roots of life-support. In this essay, the ecosystem concept will be opened to accommodate the flow of energy and materials through time and space.



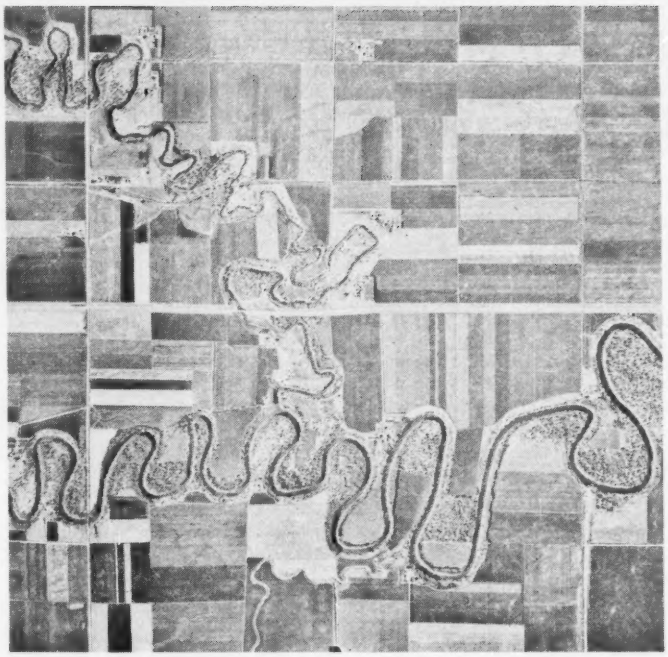
Watershed Energy and Economic Thought

It is true that man has learned to supplement the energy flux in his biologic niches through consumption of fossil fuels and it is likewise true that we consume ever increasing amounts of this supplemental energy. But albeit damaging, the human flux of energy is still but a fraction of a percent of the total solar flux at the earth's surface. Our world fuel consumption in 1975 is but one thirty-four-thousandth of the worldwide solar flux.

Fossil fuels primarily change the energy flux in the economic systems of the world, but not in the sum total of watershed ecologic systems of Earth. Fossil fuels are converted to goods and services to exchange for money to develop more fossil fuels. In most contemporary economics, materials and energy are not related to sun-power and thermodynamics. So, forget this contemporary sense of energy right now. See energy as it interrelates to watershed form and process. This will let us see watershed function – the Middle Way, the optimum way of energy flow on earth. As Gary Snyder says: "Electricity for Los Angeles is not energy." It is commodity. Earth's energy is much greater, bigger, sacred. As William Blake said: "Energy is Eternal Delight."

Robert R. Curry has been one of the strongest influences in my life in recent years. Just walking a proposed logging road and hearing what he had to say about hillslopes and running water was sheer pleasure. He is a professor at the University of Montana, Missoula, advisor on earth science to the U.S. Senate Public Works Committee and was Director of Sierra Club Research.

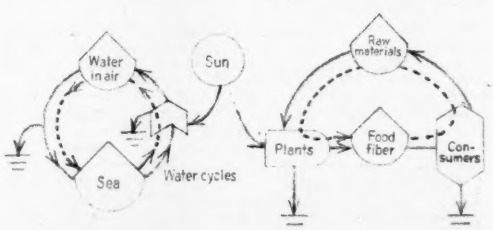
There is a real need to liberate the imagination of scientists and give them space to trip out on their own work. **CQ** *is a perfect magazine to allow loose and far-out science. Bob's article had to be drastically reduced because of limited space and I reworked it (I hope O.K.) so that more* **CQ** *readers could take his plunge into the wildness of entropy and landscape evolution. –PW*



This airphoto (map) view of stream channel form in the midwest illustrates how form reflects process and stability. The main trunk stream is meandering in a smooth sinusoidal pattern while flowing from left to right. Note that after the tributary stream discharges into the main stream, its meander wavelength and amplitude increase to accommodate the increased water and sediment. But also note that the tributary does not have a smooth equilibrium channel pattern. Close inspection reveals that it is dammed and water is taken out for irrigation. Further, at some point in time, the riparian vegetation of cottonwood trees was removed or partly cut, increasing sediment load. All of these assaults have created a non-equilibrium form that indicates that the channel will meander in an unpredictable way. This has been important in limiting the farm use of the lands adjacent to the side tributary. More land is not tilled next to the small tributary than next to the larger stream. Disturbance of the watershed has cost in terms of stability and productivity of the side-stream tributary.

The Watershed

A watershed is a system. It has energy and material flux, dominantly through the solar-energy-driven hydrologic cycle. We all understand at least the basic concepts of the hydrologic cycle, but few perceive that the form of the watershed system, as well as its stability, its equilibrium, and its biologic productivity is precisely and accurately controlled by this energy and material flux. Just as an ecosystem, a tropical forest for example, takes a form and structure that reflects the energy and material flux through it, so also does a watershed assume a form that precisely reflects the fluxes through it.



Flows of solar energy drive the material cycles of watersheds. The material is water (left) flowing between two energy "storage tanks" we call clouds and sea. The sun adds heat energy to water and evaporates it. This counters gravity creating the rain-runoff-evaporation cycle. The materials are nutrients/minerals (right). The sun energy feeds the plant "production" plant which flows through the food chain and back to soil/atmosphere when the living creatures die and decay. Both diagrams are greatly over-simplified.

The fundamental lesson to be learned is: **that a change in energy flow through a system will be reflected by a change in form in the system that was shaped by the flux.** This is a most fundamental principle that must be understood to live upon the land surface of this or any other planet.

Energy: The Flow and the Order

To repeat, all of Earth is a manifestation of energy flow and ordering. The Form of a watershed refers to its relative proportions of hillslopes, stream channels, flood-plains, and mountain tops, and the shape of these in terms of length, width, and relief. The watershed system is generally made up almost entirely of hillslopes. About one percent of the watershed area is made up of stream channels that serve to drain the system. Additionally, we must consider the factors like drainage density, slope shape and steepness, soil stability and development and relative dominance of various geologic erosional processes like gullies or landslides as all contributing to basin form.

Energy flux refers to the transformation from potential energy to kinetic energy that occurs when water flows downward through a watershed system and, on its way, does the work of erosion and transportation. Over 90 percent of the energy expended in a stream channel is dissipated as frictional heat, but the rest can do geologic work. Some energy is derived without the direct aid of the sun through movement of matter through a watershed system under the direct influence of gravity or wind. The ultimate

source of gravity-transfer potential energy is the rotational energy of the earth manifest in mountain-building forces, and the indirect effects of heat-flow from within the earth. All of these energy sources together flow through watershed systems to modify those systems and transport materials within those systems.

Watershed Equilibrium

This watershed system works so remarkably well and is so perfectly integrated no matter what its size, geologic history, vegetative cover, or region of the world, that there must be some underlying principles of form and process that control its origin and development.

The hillslopes provide runoff and sediment to the stream channels in just the right proportions so that the river may carry them out of the watershed over the gradient (steepness) that must be traversed. All of the tributary watercourses discharge into the main streams at precisely the elevation of the main stream. Each side stream is accurately scaled to its individual watershed.

The critical thing to remember about watershed systems is that the rivers, the hillslopes, the mountain-tops, and the flood-formed bottom-lands are really all part of one watershed system. All are integrated with each other. The shape of the hillsides controls the rate of energy expenditure of water flowing over and through them, and are thus themselves a function of the local energy flux. *All biotic elements in the watershed interact with and modify the energy flow through the watershed system so it therefore clearly follows that the shape of a watershed is a function of what lives there.* This perfectly fundamental and very simple fact has seemed to escape mankind's segmented and regimented thought. We seem to believe that the non-biologic portions of a watershed can be changed to suit our perceived needs without a concommitant change in the physical system. But energy ties both together. If we remove a forest cover that earlier had stored and converted a portion of the solar energy falling upon that system and that had intercepted and transpired a portion of the water falling on that system, then it follows that the energy flux through that watershed is changed and the very shape of the hillside and stream channels in that watershed must adjust as rapidly as possible to accommodate the change.

An equilibrium state is one in which the many variables of a watershed system are dynamically balanced. On slopes, for example, the profile is the result of a balance between runoff, infiltration, and erosion. All of these are modified by the degree of soil development since that in turn controls what grows on the hillside and thus controls runoff, infiltration, and erosion. Soil development is in turn determined by the age and stability of the surface. Age and stability are in part a function of the history of runoff, infiltration, and erosion at the site; which are themselves in turn a function of the history of climatic and biotic activities on the hillside. Each integrally intertwined loop rests within a larger loop and all determine the state of equilibrium. Upset of the balance can be compensated only to a certain point, and then disequilibrium occurs.

We are most familiar with disequilibrium through the interactive reactions in a watershed following logging. Runoff intensity usually increases, thus causing erosion of hillslopes. Simultaneously, flood waters reach watercourses faster due to denser and more effective integration of rills and ephemeral channels on the hillslopes, and flood heights increase. Increased sedimentation and increased flooding lead to increased lateral erosion of stream channels that

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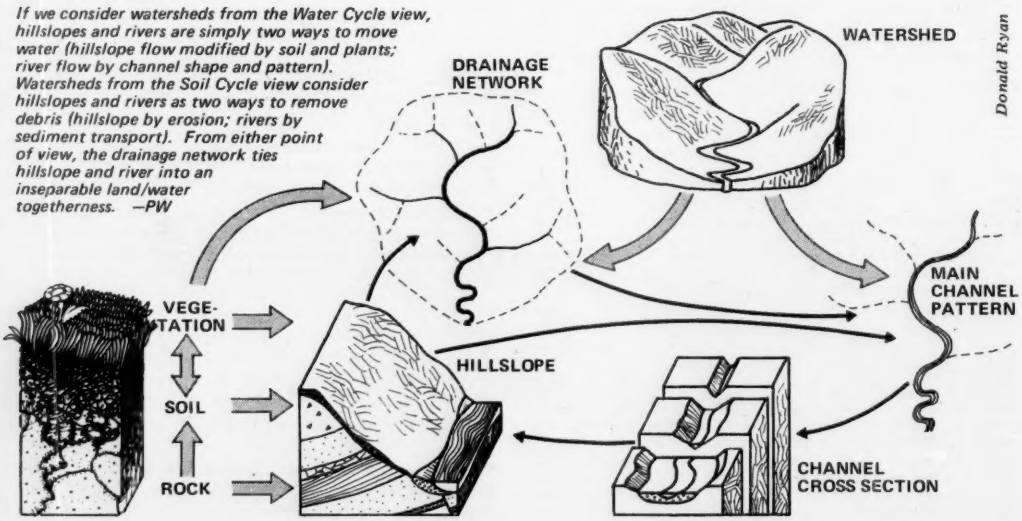
WATERSHED SHAPE

If we consider watersheds from the Water Cycle view, hillslopes and rivers are simply two ways to move water (hillslope flow modified by soil and plants; river flow by channel shape and pattern). Watersheds from the Soil Cycle view consider hillslopes and rivers as two ways to remove debris (hillslope by erosion; rivers by sediment transport). From either point of view, the drainage network ties hillslope and river into an inseparable land/water togetherness. —PW



Donald Ryan

must change their channel geometry to accommodate a greater percentage of sediment load to water discharge. This results in a wider, shallower stream channel flowing at a somewhat steeper gradient. A wider channel will undercut adjacent hillslopes downstream from the area disturbed by logging. These undercut hillslopes are steeper and thus erode faster, thus further adding insult to injury in the already sediment-choked stream. Aggrading channels result that plug free-flowing watercourses with braided changing streams, and side slopes continue to ravel and erode until the slope steepness is once again reduced to an equilibrium profile that extends to the drainage divides. In this fashion, a headwater change in biota can effect a change in the shape of the whole watershed below it.

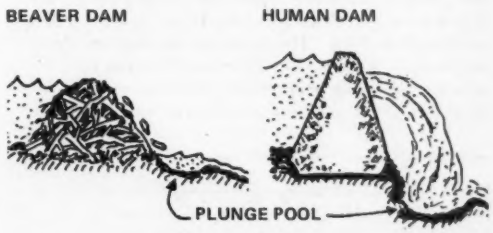
Law of Minimum Variance

Stream channels and hillslopes assume a form that is adjusted very delicately to optimize two different tendencies. The first tendency is: **watersheds will tend to assume a form in which the rate of energy expenditure remains constant through time and space**. This means that the longitudinal (descending) profile of a river or the steepness of a hillslope will adjust itself so that the water flow will not become more erosive or less erosive as discharge (runoff plus rainfall) increases. The system will respond to minimize the effects of the agents causing the change, but some change will occur.

For example, what if the slope is made less steep? Someone cuts a road into the slope and locally breaks the equilibrium slope profile. The stream now has less sediment to move. It has increased energy. It uses that energy to downcut. That downcutting locally makes the slope immediately adjacent to the stream steeper. The material eroded in the channel becomes sediment in the stream and replaces that previously supplied from the altered hillslope. Each of these reactions work against the action resulting from the disequilibrium and work to reestablish a balance. This is LeChatelier's Principle and is manifest in all natural systems governed by basic thermodynamic law.

Similarly, compare a watershed dammed by a beaver vs. man. The hillslopes above the dam continue to function as if the dam were not there. The river above the dam continues to carry water and sediment as before. But when the flowing waters reach the quiet water impounded behind the dam, the river gradient suddenly becomes zero and sediment transport essentially stops. Water continues to pass down toward the dam, but sediment forms a delta at the point of contact between the reservoir and its inlet. This deposition goes on to build up a wedge of sediment extending upstream well above the reservoir level so that the gradient of the feeding river increases to better carry the sediment into the reservoir and toward the dam. Ultimately, as any old beaver knows too well, the river constructs what amounts to a sediment bridge across the reservoir and over the dam, thus reestablishing sediment transport and rendering the reservoir ineffective.

To pursue our example, what of the water that has been passing over the dam all this time? At the spillway or point of overflow, the local stream gradient has been greatly oversteepened and the water has been deprived of its sediment load. At the base of the dam or waterfall this higher velocity sediment-free water has great erosive force and forms a plunge-pool, undercutting the dam and tending to remove it to reestablish longitudinal equilibrium of the watershed system. If beavers rather than the Corps of Engineers constructed the dam, long experience has taught that a leaky dam will hold more water than a tight dam that overtops and erodes at a concentrated spot. Thus beaver dams can be quite effective sediment traps for long periods (most human dams no matter how large cannot be expected to remain unplugged for more than about 100 years, yet some mountain-meadow beaver communities have effectively trapped sediment for millenia).[1]



Below a dam sediment-free water is discharged with more erosive force than water at the same site would have been prior to construction of the dam. This water will erode with increased strength. The net effect of such erosion is to deepen the valley below the dam, thus steepening the valley gradient at the very base of the dam and further causing its undercutting while simultaneously increasing the sediment load of eroded materials and carrying that over a lesser gradient since the incised stream cannot lower its ultimate baselevel. All of this tends to balance the system while working to remove the obstacle.

Many more examples could be given, but one more will suffice to illustrate the range of adjustments possible. Suppose a watershed is urbanized. Homes are built, roads are paved and compacted, areas are

> **"Niagara has power and it has form and it is beautiful for thirty seconds, but the water at the bottom that has been Niagara is no better and no different from the water at the top that will be Niagara. Something wonderful and terrible has happened to it, but it is the same water and nothing at all would have happened if it had not been for an aberration in one of nature's forms. The river is the water's true form and it is a very satisfactory form for the water and Niagara is altogether wrong."**
>
> *–Gertrude Stein, 1935*

1. The beaver didn't just build a dam, it changed the energy flow in the watershed. Other components of the watershed such as the river and alders or aspen will try to balance this by removing water on the reservoir.

roofed-over and the general permeability of a part of the watershed is impaired. In this case runoff is provided to the watercourse faster than it would have been in an undisturbed situation. In a greatly urbanized case, total volume of runoff may increase since moisture that previously filtered into the groundwater system or previously was transpired or evaporated directly from the watershed will now run through a gutter or street and enter watercourses more directly.

But the real change is not in the volume of water but its routing to the stream. More rapid routing means faster rise of the runoff flood peak. In essence, it means that the shape of the watershed is wrong in comparison to the geometry of the stream draining it. A natural watershed would respond by increasing the number of overbank flows that occur. In other words, a flood height that occurred once every hundred years now will occur once every twenty years or less. Floods become bigger and more frequent. This is so because the passage of water into the rivers is faster and the watershed shape cannot adjust to equalize the rate of energy utilization all along the drainage network, so flooding and sediment movement increase to locally balance the system.

The attempts of the drainage network (now pipes, gutters as well as streams) river channels and cement aquaducts and hillslopes (both pavement and soil) to re-equilibriate may progress for centuries. Parts of the Susquehanna watershed have been rapidly urbanized. Recently, following a rare but not unpredictable incursion of a tropical hurricane, sudden catastrophe ensued. A single 100-year rainfall yielded a 1,000-year flood. Eastern U.S. flood victims defined and zoned flood-plain areas based upon a historic record of flooding that no longer bears much direct causal relationship to suburban land use in the Susquehanna watershed. No wonder they feel eligible to apply for disaster-relief funds. Similarly, the Big Thompson Canyon in Colorado has experienced a flood of inestimable "rarity" of on the order of a one-in-ten-thousand-year event associated with only a once-in-300-or-so-year precipitation intensity following the paving and urbanization of a critical part of that watershed adjacent to Rocky Mountain National Park. LeChatelier's Principle seems to govern the removal of those very human agents perturbing the watershed systems.

Hillslope form and man-made obstructions make energy distribution unequal for different stretches of the watershed. Waterfalls are eroded by the river to equalize the energy flow rate. Dams are undermined for the same purpose. The watershed "wants" to vary minimally (not erratically) and will change its form (hillslope, drainage pattern, river channel, vegetation) in order to govern its energy flux.

The Principle (Elegance) of Least Work

Watershed equilibrium is not just a result of a constant rate of energy spent in erosion, deposition and transportation of materials in the system. It is also, the result of energy doing the least work possible at each stage of the river and hillslopes.

For example, we may wonder why rivers are not sloped straight down from headwaters to mouth. A straight river, after all, would minimally vary its slopes. But, a river that has a straight slope would have a high variance in the amount of work done along the profile.

There is so much more water downstream (more tributaries and more collection of rainfall), streams and slopes become progressively less steep downstream. That is, streams and slopes tend to be concave upwards. The concave profile is necessary to adjust the work expenditure to minimum variance. Consider: One hundred cubic feet of water falling one foot per mile can do as much work as 10 cubic feet of water flowing down 10 feet per mile over the

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Entropy and Landscape

While it is true that on a flat surface, the shortest distance between two points is a straight line, this is not true for a point (like a water droplet) in motion. At any moment along the line, the droplet can theoretically go in any direction. In a space capsule, without gravity, water droplets do, in fact, have this "total" freedom of possibilities. Possibilities of going in any direction are limited on Earth by the constraints of gravity. Under the influence of gravity the shortest distance of a free moving particle between two points is a meandering (sinusoidal) curve. This is the path of a rather inebriated man attempting to go from the bar to the restroom but unable to keep his goal completely in focus. The vertical slope of a river as well as the horizontal meander of a river as well as the pools (deep water) and riffles (shallow water) inside the channel all approach a meandering line.

In theory, these are called "random walk" models constrained by gravity. They relate to entropy in that entropy always increases as potential energy is used up. Think of the rain drop on the mountain top. It is full of possibilities and potential energy. It can flow down in any of 360 degrees (any slope of the mountain) and can do all kinds of work as it flows to the sea. It has low entropy. By the time the droplet is in the ocean it has used up all that potential: it can only float (unless given new energy by the sun-driven water currents or evaporation or moon-driven tides) and has no work potential. Entropy has increased. Lakes half-way down the slope temporarily remove possibilities of movement but retains potential energy. Waterfalls eliminate possibilities of movement (the droplet essentially falls straight down) and uses up potential energy fast.

Rivers "try" to make the transition from maximum possibilities of movement and maximum potential energy (mountain top) to minimal possibilities of movement and minimal potential energy (the sea) as even as possible. Thus, we say a river tries to gain entropy equally along all its stretches (parts). This is the foundation of the Law of Minimum Variance and the Law of Least Work.

Braided flow on gravelly bed of Muddy River a short distance above its junction with the McKinley River, Alaska. Most of the sediment is stored in the channel, so the channel changes its position continuously to flow around the load of sediment (mid-channel bars) it cannot handle. Braided rivers have erodable banks so that the bars can be circumvented rather than washed away. Braided rivers, like meander rivers, are an equilibrium river form – having a particular bank material and a debris load too large to be carried by a single channel. In itself, braided rivers are not "overloaded" with sediment but, if the river bed is building up, braiding may result from upstream disruption of the watershed.

same horizontal distance (100 ft-lbs of work). If more volume of water lower in the watershed can do more work, the slope must be less to balance the work load.

This is a second thermodynamic principle for open, steady-state systems: **a watershed tries to do the least work possible, it tries to minimize work at each point along the river. In other words, hillslopes and streams try to maximize the efficiency of energy through time and space.**

Instead of the descending pattern of a river, now consider the horizontal pattern. A straight channel like an irrigation ditch or channelized stream can transport water and sediment efficiently only for given ratios of water and sediment. If the proportions change in space or time, sediment is temporarily stored within the channel and the river must be able to swing around the gravel bars during low flows. In addition to meandering, the river may alternate deep pools and shallow riffles. These forms of channel pattern do the least work as well as minimize variance in the rate of expenditure of that energy as work.

In summary, unlike living creatures, running water cannot store up energy accumulated in its downward fall so it must use it up as soon as it acquires it. Water acts by erosion and transportation and deposition of hillslopes. As it moves, hillslopes and channel create a form that "tries to" minimally vary its shape and minimally vary the expenditure of the water's energy throughout time and space.

The Middle Way

In a river watershed, equilibrium is manifest by balancing the tendency to do the least work necessary in a particular place in the river and the tendency to expend energy at a constant rate through the system.

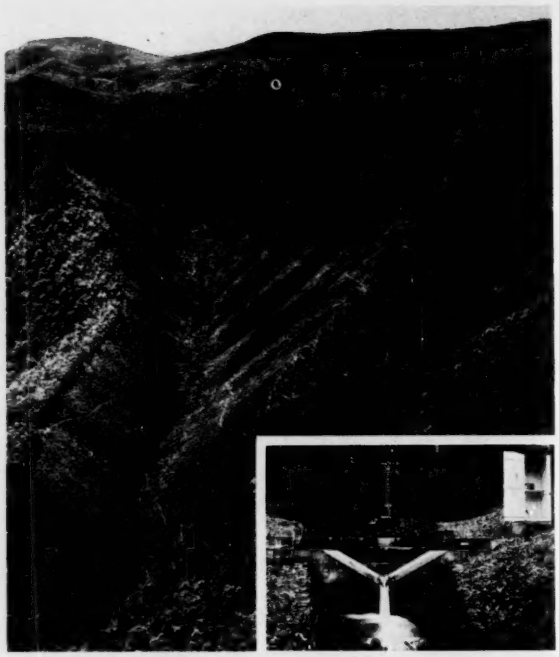
Since the system is itself formed as a result of energy flow that is in turn controlled by these separate but interactive tendencies, it follows that rivers achieve a balanced form. Flowing water seeks a middle way – a dynamic equilibrium between these two tendencies.

Stream and slope profiles are neither straight nor exponentially concave, but generally are a combination of the two. Some slopes are straight where discharge may remain constant downstream or other hydraulic variables may adjust to compensate for increased discharge. Some slopes are even convex such as near the summit of a hill where runoff may seldom if ever occur due to the permeability of the soils. Each slope reflects the balances that result from the flux of energy through it.

[more →]

"Do you think you can take on the universe and improve it? I do not believe it can be done. The universe is sacred. You cannot improve it. If you try to change it, you will ruin it. If you try to hold it, you will lose it."

–Lao Tsu
Tao te Ching



U.S. Forestry Service

Distribution of rainfall on vegetated and bare areas into surface runoff, sub-surface flow, and base flow. Width of arrows indicates the relative amount of each component.

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Experimental watersheds at the Coweeta Hydrologic Laboratory in the mountains of western North Carolina. All the trees have been cleared upsetting productivity of plant life but not hill-slope form. Nevertheless, rain-fall follows a new path as it traverses the hillslopes. This is shown in the top diagram. Below surface water flow decreases (narrow arrows) while surface runoff increases. This increase in surface runoff may lead to disequilibrium and a new drainage network.

Insert shows V-notch weir used to measure water flowing out of watershed. Experimenters are comparing this watershed to an undisturbed forested watershed.

The optimization of balancing tendencies in a watershed system is "sacred." When the form of a watershed is changed through physical manipulation of the non-biological components of the system, the flux of energy through the system must change and this will affect both the living and inorganic components of the system. When the ecosystem is changed, then the energy flux will change and the energy distribution and rate of transfer will change resulting in a change in the physical form.

Ecosystem/Watershed Productivity and Stability

An important corollary to the principle that a change in flux = a change in form is that a change in watershed form results in a decrease in site productivity and/or stability. This is the single watershed concept that most affects mankind and other organisms living in or below watersheds.

Bear in mind that all life is a storage/transfer medium for energy. Life exists in energy flux niches. Solar energy is trapped by the plants that live on the surface of the watershed. It is held in storage by plants, converted to other energy-bundles by being eaten or by the plants themselves. The efficiency of trapping solar energy by a watershed is measured by the time delay (length of storage) that is possible in the living systems inhabiting that place. Inanimate energy storage such as water in a reservoir or heat in a rock cannot be controlled by all life forms in an ecosystem. There is no way that the energy can be stored for very long in these inanimate media and much dissipates before a living creature can utilize it. Efficient energy utilization in a natural system is the result of a great many conversions and storages of energy as it passes through that system. Many available energy flow niches are filled with living subsystems that can use the flowing energy. The energy "ages" in the system. The system is "mature."

But, despite much popular literature, natural communities are not just a biological system. The ecosystem is a chemical and physical system too. The efficiency and maturity of the ecosystem is largely dependent on the degree of chemical weathering of the rocks and soil and the biological availability of the nutrient portions of the system. In simplest terms, the soil status controls the efficiency of energy use by the ecosystem. Living organisms require both nutrient and energy fluxes.

Stability in natural communities means that the "system" has developed an inherent resistance to change. It is to some extent self-governing. Thermodynamically, stability must be seen as the ability of that system to sustain stress without loss of potential thermodynamic efficiency. This is really a very simple concept, if viewed from the perspective of geologic time. A stable system can withstand a fire or insect infestation or drought without so great a loss of its "nutrient capital" in both biomass (plants and animals) and soil/rocks that the watershed community's ability to trap and convert solar energy is impeded beyond the community's response-time to that stress.

For example, after a prairie fire, nutrients are washed out of the system and many are lost in the fire. A prairie fire in the fall greatly curtails energy fixation by the ecosystem for a year or two but by then a

mosaic of species would exist that could trap energy and maintain nutrient cycles with a degree of closure or retention that is at least equal to that before the fire. From then on, the prairies system increases its nutrient capital and biologically-stored energy until the time of the next major stress. The net result through time is a maintenance or gain of stress-resisting nutrient capital in the soil of that ecosystem. In an unstable system, long times are necessary to replace those nutrients. Plant succession reflects the intervening less-stable state.

The more "mature" soil systems provide for greater nutrient reservoir storage to permit wider adaptability and niche utilization by the biota. This leads to maximization of energy capture and use efficiencies. Optimization of watershed equilibrium balance leads to land surface stabilization which in turn permits maximal soil development. Optimization in biologic systems results in the maximization of both site stability and site productivity. As Garrett Hardin has stated, you cannot simultaneously maximize both productivity and stability in natural systems.

An eutrophic pond uses more solar energy to fix more organic carbon than a mixed woodland. That is, the eutrophic pond captures more solar energy which makes it very productive but pond life is unstable because of the "run-away" production of algae which may, in extremes, kill off fish. The mixed woodland uses less solar energy but is more stable: the amount of tree flesh (biomass) doesn't fluctuate wildly, the number of species doesn't vary greatly, the productivity is less than the eutrophic pond but varies minimally.

One can imbalance toward greater stability or toward greater productivity, but one cannot achieve a higher combination of the two than that of Lao Tsu's "universe." Over time, and through the changes that are the rule through time, natural communities achieve a balance of maximum productivity and stability when their watersheds are in dynamic equilibrium. Once a hillslope begins to erode differentially to adjust to different runoff and infiltration conditions, its soil mantle is degraded. Such soil loss or structural change will result in a decreased ability of that soil to sustain a stable, diverse group of life forms that will utilize the energy flux as fully as is potentially possible.

We thus have an ecosystem/watershed theorem of behavior. **Perturbations in watershed equilibrium will decrease system efficiency in trapping energy and will thus decrease long-term productivity.** This theorem is critical to understanding man's agricultural and silvicultural interactions with watersheds. Forests on public lands are managed according to a "multiple-use sustained-yield" act which states that yields must be maintained in perpetuity. Watershed manipulations must not cause a physical change in slope profile equilibrium, nor increase the rate of physical soil erosion, nor break the nutrient/materials cycle to the extent that it will upset the community's efficient use of solar energy. Any time mineral nutrients stored in soil or litter are no longer demanded by plants and animals (e.g., clearcutting), these nutrients may be lost from the system through runoff into the water courses. A natural floodplain may trap the nutrients and keep them nearby, but they are lost from the hillside sites. Thus, site productivity and stability will decrease until very slow geologic mineral weathering returns the nutrients to the soil reservoir over future millenia..

Watersheds and History

The watersheds are our energy mediators. They are our life support. They provide for ecosystem support. To maintain their energy trapping effectiveness under increased stress, we must supplement energy and nutrient storage such as through fertilizer or tractor-power in agronomic systems, and these are unstable systems. We cannot make the watersheds work better in temperate geologically evolving regions of the earth.

We must learn to respect the watershed because it comprises the very roots of our life support system. It is the great tributary system that reaches out to collect material and energy which it feeds to its biota. It is really the root system for life.

Watersheds have built-in historically "learned" responses that are adaptable to major changes at the earth's surface. They have response characteristics to optimize energy flow and nutrient retention following fire and flood. No fire is "bad" in the sense of destroying a watershed. Change may go on rapidly after a fire as a new equilibrium state is reached, but the watershed has gone through this before and will probably reoccupy old flood plains long abandoned or move sediments that have been waiting long for this large flux event. The key is that the shape of the system reflects the history and thus the adaptability of the site. The great river terrace sequences of the Connecticut River valley or the Missouri reflect past periods of enormously increased flows with even greater increases in sediment loads. These discharge events occurred during the past periods of major glacier advance into headwater areas. These glacial episodes will occur again and the rivers will readjust to them and begin once again to move sediment left beneath Hartford or Great Falls on a blustery afternoon 20,000 years ago. It is all going according to perfect natural plan. ■

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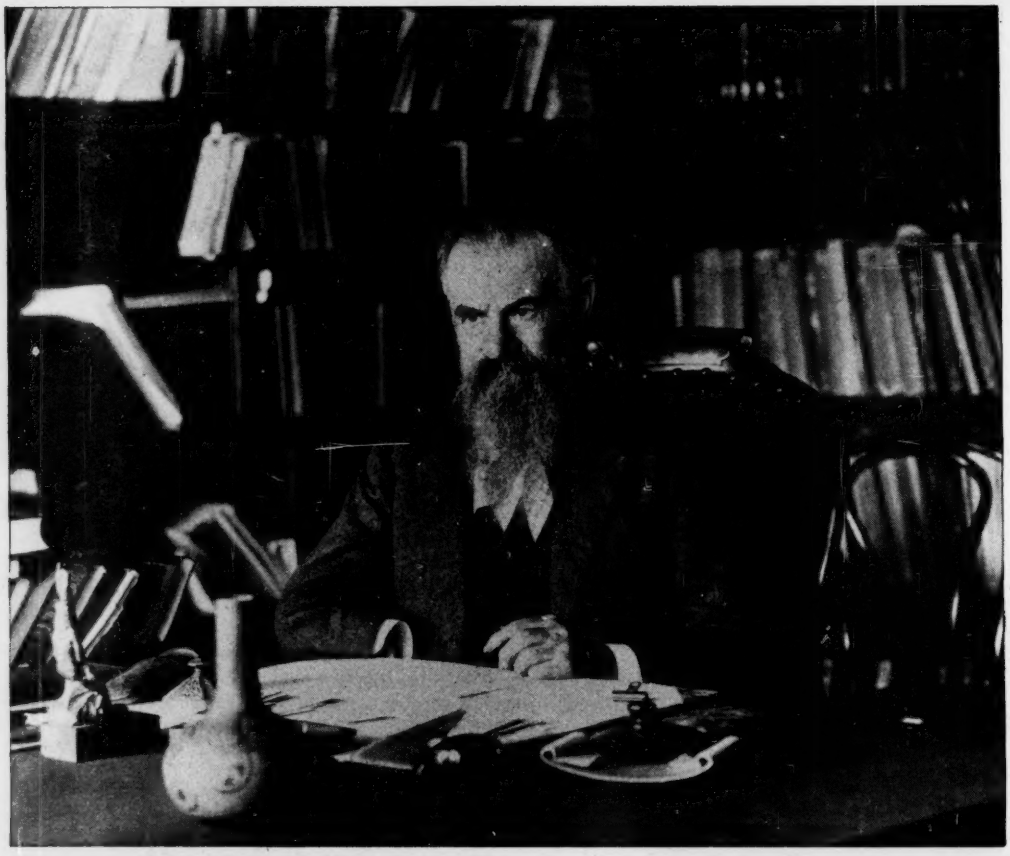

Smithsonian Office of Anthropology

JOHN WESLEY POWELL

Conscience of the Colorado

WE ARE NOW READY TO START ON OUR WAY DOWN THE GREAT UNKNOWN. Our boats, tied to a common stake, chafe each other as they are tossed by the fretful river. They ride high and buoyant, for their loads are lighter than we could desire. We have but a month's rations remaining. The flour has been resifted through mosquito-net sieve; the spoiled bacon has been dried and the worst of it boiled; the few pounds of dried apples have been spread in the sun and reshrunken to their normal bulk. The sugar has all melted and gone its way down the river. But we have a large sack of coffee. The lightening of the boats has this advantage: they will ride the waves better and we shall have but little to carry when we make a portage.

We are three quarters of a mile in the depths of the earth, and the great river shrinks into insignificance as it dashes its angry waves against the walls and cliffs that rise to the world above; the waves are but puny ripples, and we but pigmies, running up and down the sands or lost among the boulders.

We have an unknown distance to run, an unknown river to explore. What falls there are, we know not; what rocks beset the channel, we know not; what walls rise over the river, we know not. Ah, well! we may conjecture many things."

John Wesley Powell in **Exploration of the Colorado River and Its Canyons.** **See review, p. 25.**

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Green River, Wyoming. May 24, 1869. A few men step blinking into the bright morning from the station eating house, where they have stuffed themselves with Ah Chug's canned-apple pie. They troop down to four boats tied below the railroad bridge. Ten men get in and with little ceremony throw off the ropes. As the current pulls them into the main channel, they wave their hats. On shore the onlookers wave back; some shake their heads. The tiny craft bob around the first bend and are gone. One of America's last great explorations has begun.

The odds for success – even of coming out alive – aren't good. Ahead lies one of the few blank spots left on the map of the continent, the untraveled gorges of the Green and Colorado Rivers. Where the only way out is the other end of the Grand Canyon, three states away. Where, they have been told, the canyon walls are so sheer there will be no places to beach their boats. Where they will plunge over waterfalls more furious than Niagara. According to the wisdom of the day, they might as well be casting off for Hades.

Worse, John Wesley Powell, the five-foot-six man in the lead boat, already is missing one arm, smashed by a minnie ball in the battle of Shiloh Church. Worse, the expedition is short on equipment. What it has was begged from a variety of government agencies and private institutions, which looked upon Professor Powell from obscure Illinois Wesleyan University as a crackpot. But worst of all, no one seems to care, "No one was willing to spend much time listening to a college professor who wanted to float off, probably to his death, on some Western river."

August 30, 1869, a hundred days later. Four men, an Indian, a Mormon named Asa, and his two sons, are fishing at the confluence of the Virgin and Colorado Rivers. Months earlier John Risdon caught the public's attention by claiming to be the sole survivor of Powell's abortive adventure. The Governor of Illinois wept as Risdon choked out the story of how he left the group to hunt, only to see the four boats shoot over a mammoth waterfall into a whirlpool. From his vantage point he stood helpless as hundreds of yards below him the maelstrom ground men and boats to bits, while – Risdon always tearfully added – the noble Powell stood at the helm with jaw set, a brave sailor to the last. The morbid account is picked up by newspapers and electrifies the nation, then after a few weeks Powell is forgotten.

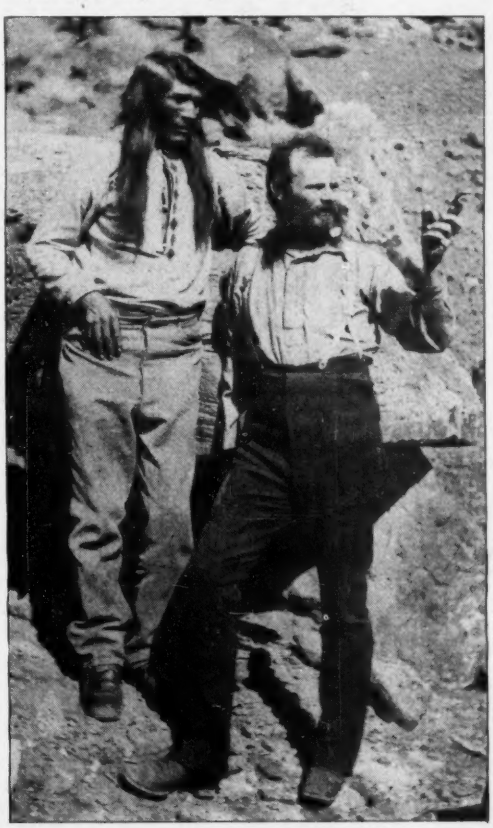
Meanwhile, out West in Salt Lake City, Brigham Young, perspicacious leader of the Mormon Church, has instructed Asa to look for any "relics" of the party that might come floating out of the lower end of the Grand Canyon. Instead, Asa sees six battered but cheering men rowing toward him. Risdon was a fraud.

Just two days earlier, however, fearing the maws of the last cataracts, four men left the expedition in an attempt to scale the walls and reach the nearest Mormon village. Unknown to Powell, they lie bloated in the sun, riddled with Shivwit arrows. In addition to the men, Powell is short one boat, the flagship Emma Dean, shaken beyond repair in the rapids below the Little Colorado River. But for that, the expedition is a total success.

Asa sends the Indian trotting off to the little town of St. Thomas, which flashes the news to the world via the **Desert Telegraph**. The newspapers go wild. Powell has entered the labyrinths of the Grand Canyon of the Colorado, a 35-year-old unknown, a maimed, self-educated farm boy from the Midwest. He has emerged triumphant over all handicaps – the stereotypic hero of the 19th century.

As sensational and scientifically useful as his venture proved to be, the trip was the beginning of a reform campaign, not the end of a career, an early high

Tau-gu, a chief ot the Paiute Indian tribe, and Major John Wesley Powell, in southern Utah.



Smithsonian Office of Anthropology

Peter Wild teaches creative writing in Tucson, Arizona. This article first appeared in the best watershed paper west of the Rockies, **High Country News** (Biweekly; $10.00/year; 140 N. Seventh St., Lander, Wyo. 82520). He hopes it will be part of a book on conservation pioneers in the West. Peter's book of poetry, **Cochise** (1973, Doubleday, $2.50) was a Pulitzer nominee. He is a strong voice in Arizonans for a Quality Environment. –PW

Smithsonian Office of Anthropology

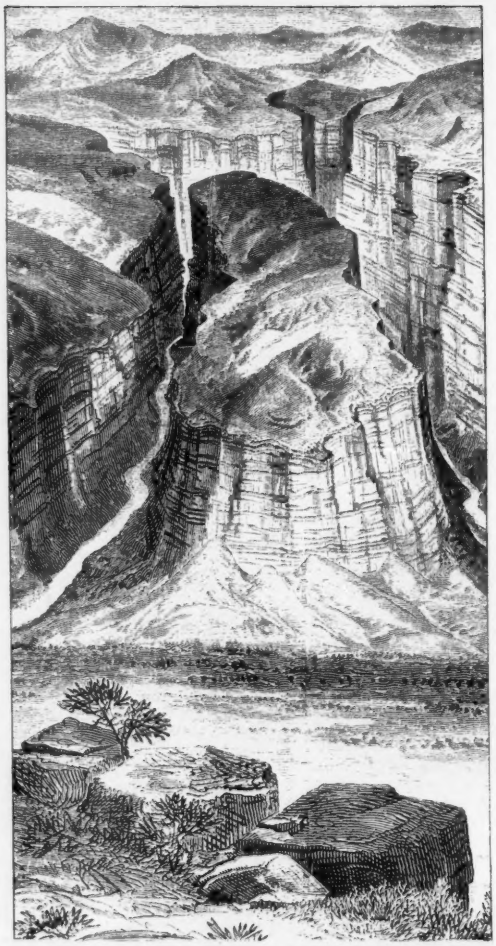
point that would become symptomatic both of Powell's accomplishments and his personality throughout his next 25 years of public service. As even his enemies would later admit, Powell was a gentle, noncompetitive man. Typically, when the four men deserted his party on the Colorado, he offered words of encouragement and a generous share of the meager supplies. As a measure of his character, in the years ahead he never accepted military escorts for his small survey crews, preferring to befriend the various tribes, winning their trust by showing deep respect for their cultures. An instant celebrity after the canyon adventure, he carried the fame with dignity.

Furthermore, he was a realist. He knew that his planned studies would depend on further knowledge, and that the massive amount of information he needed about the West – the kind that would support the conclusions of his **Arid Lands** volume – could be gotten only by financial aid from the government. He shrewdly divided the next 10 years between exploration of the Rocky Mountains and lobbying forays to Washington, D.C., to support them. He made 30 trips to Arizona, Colorado, Idaho, Nevada, New Mexico, and Utah, mapping, documenting the water and mineral resources, recording Indian cultures, sending back crates of plants, animals, and artifacts to the Smithsonian. He was discovering a country that most Westerners, viewing their new land through exploiters' eyes, never saw.

His successes made enemies. Other scientists resented his acclaim. More debilitating, Western Congressmen representing the banks, railroads, and land speculators began to look askance at the appropriations for expeditions whose leader went around informing the public that its Western treasure house was being rifled by special interests. They began to see the political implications of a science that refused to obey their commands to speak only when asked how to extract riches from the Rockies as quickly and as efficiently as possible.

Nevertheless, Powell himself was a supreme politician. He knew how to consolidate gains. He had the ear of President Grant, his commanding officer during the Civil War. Riding the wave of apprehension created by his **Arid Lands** report of 1878, Powell persuaded Congress to establish the United States Geological Survey (U.S.G.S.), thus uniting several independent studies under one agency. It was a sleight of hand long in the making by the scientist. Instead of rushing in to become its new director, however, he engineered the appointment of a brilliant young friend, Clarence King, to the post. The move allowed Powell to sidestep any political furor resulting from the birth of the U.S.G.S. It also allowed him to pursue his studies of native cultures as head of the newly created Bureau of Ethnology, tucked away beyond the reach of politicians in the Smithsonian Institution.

Within a year King resigned – himself a victim of the gold mania – and Powell quite naturally became head of both agencies. His stature grew over the years as both bureaus issued voluminous studies recording the West's unique heritage. William Henry Holmes referred to the Bureau of Ethnology publications as, ". . . among the most important contributions to human history ever made by an individual, an institution, or a state."



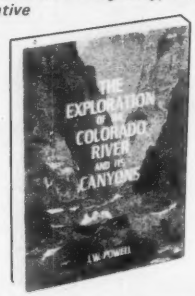
From **Exploration of the Colorado River and Its Canyons**

Yet Powell never was able to drive the exploiters from the field. Regrouping in order to protect their monopolistic practices, they launched attack after attack on Powell through slashing various appropriation bills. For two decades he had sat with patience and dignity through similar battles, infuriating his adversaries with his candor.

Now he was 60, and the stump of his amputated arm kept him in constant pain. He longed for time to write, to stroll the beaches and poke around in the shell heaps left by Indians. Because the battle focused largely on him as a reform personality, in 1894 he quit, thus saving the causes he supported from further reductions in funds ■

Powell's Classic

Powell's writings as river-runner, the first European-American to descend the Colorado, pioneer of watershed geology and keen recorder of 19th century Native American life. Equal in style to Thoreau, Muir or Hudson. —PW



The Exploration of the Colorado River and Its Canyons
John Wesley Powell
1965; 400 pp.
$3.50 postpaid
from:
Dover Publications
180 Varick St.
New York, NY 10014
or Whole Earth

They take me from Oraibi to Shupaulovi to witness a great religious ceremony. It is the invocation to the gods for rain. We arrive about sundown, and are taken into a large subterranean chamber, into which we descend by a ladder. Soon about a dozen Shamans are gathered with us, and the ceremony continues from sunset to sunrise. It is a series of formal invocations, incantations, and sacrifices, especially of holy meal and holy water. The leader of the Shamans is a great burly bald-headed Indian, which is a remarkable sight, for I have never seen one before. Whatever he says or does is repeated by three others in turn. At one end of the chamber is a series of tablets of wood covered with quaint pictures of animals and of corn, and overhead are conventional black clouds from which yellow lightnings are projected, while drops of rain fall on the corn below. Wooden birds, set on pedestals and decorated with plumes, are arranged in various ways. Ears of corn, vases of holy water, and trays of meal make up a part of the paraphernalia of worship. I try to record some of the prayers, but am not very successful, as it is difficult to hold my interpreter to the work. But one of these prayers is something like this:

"Muingwa pash lolomai, Master of the Clouds, we eat no stolen bread; our young men ride not the stolen ass; our food is not stolen from the gardens of our neighbors. Muingwa pash lolomai, we beseech thee to dip your great sprinkler, made of the feathers of the birds of the heavens, into the lakes of the skies and sprinkle us with sweet rains, that the ground may be prepared in the winter for the corn that grows in the summer."

At one time in the night three women were brought into the *kiva*. These women had a cincture of cotton about their loins, but were otherwise nude. One was very old, another of middle age, and the third quite young, perhaps fourteen or fifteen years old. As they stood in a corner of the *kiva* their faces and bodies were painted by the baldheaded priest. For this purpose he filled his mouth with water and pigment and dexterously blew a fine spray over the faces, necks, shoulders, and breasts of the women. Then with his finger as a brush he decorated them over this groundwork, which was of yellow, with many figures in various colors. The three women remained in the *kiva* and took part in the ceremony as choristers and dancing performers.

Beyond the Hundredth Meridian

Powell, intellectual gunslinger, confronts the myth of the Limitless West; shoots straight; dents 19th Century History and then is buried by King Cash. A biography of the times, not the man. —PW

Beyond the Hundredth Meridian
(John Wesley Powell and the Second Opening of the West)
Wallace Stegner
1953; 438 pp.
$3.95 postpaid
from:
Houghton Mifflin Co.
Wayside Road
Burlington, MA 01803
or Whole Earth

His understanding of the West was not built on a dream or on the characteristic visions of his time, for on one side he was as practical as a plane table. The mythologies of the seventies and eighties had as little hold on him as the mythological tales of Hopi or Paiute: he knew all about the human habit of referring sense impressions to wrong causes and without verification. His faith in science was a faith in the ultimate ability of men to isolate true — that is, verifiable — causes for phenomena. Also, he knew a good deal about the human habit of distorting facts for personal gain, and he fought western land interests and their political hatchetmen for years, out of no motive but to see truth and science triumph and the greatest good come to the greatest number over the greatest period of time, according to the American gospels.

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To work through that body of report and polemic is to realize how consistent, by now, his [Powell's] views about the arid region had become, and how widely his plan reached to embrace the related problems of land, water, erosion, floods, soil conservation, even the new one of hydroelectric power; and how behind the plan was a settled belief in the worth of the small farmer and the necessity of protecting him both from speculators and from natural conditions he did not understand and could not combat. . . . The key ideas were hammered at over and over in an attempt to break down tradition and the feeling that it was unpatriotic in a Westerner to admit that his country was dry.

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The best approach was by first organizing the West into hydrographic basins which would be virtually self-governing and hence able to negotiate with other similar basins, as well as to control their own watersheds clear to the drainage divides. Inter-basin water law would offer a sound basis for the development of interstate water law, whereas to permit development of water by local franchise was to permit monopoly and waste and the peonage of the small farmer. Moreover, no individual or company could afford the enormous engineering works that were necessary for proper development of the great rivers and the maximum use of water. The ideal way was co-operation: he would have supported federal construction only as a preventive of local grabbing.

Reprint this book!

Powell's **Report on the Lands of the Arid Region of the United States** *is the most beautiful environmental impact report ever written (1878). Various historians have compared* **Arid Lands** *to* **The Federalist**. **Arid Lands** *is definitely accurate prophecy. The basic soul of the European-American experience in North America lurks among the pages. Just the first 45 pages changed national consciousness by rubbing American illusions of the West against strong clear descriptions of the Colorado plateau and the Great Deserts. —PW*

Arid Lands *was last published by Harvard University Press (1962), Wallace Stegner (Ed.), but is currently out of print.*

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WATERSHED VIGNETTES

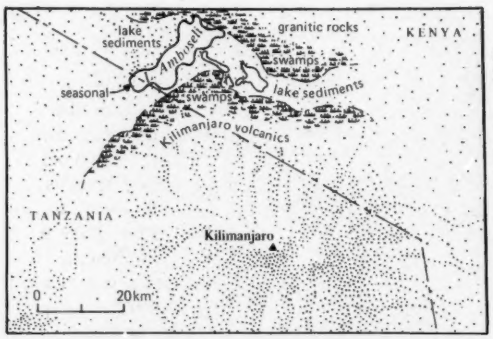
Five Encounters of Human Lives With Nature's Events

BY THOMAS DUNNE AND LUNA B. LEOPOLD

AMBOSELI NATIONAL PARK, KENYA

AT THE FOOT of Mt. Kilimanjaro in southern Kenya, Amboseli National Park is centered on a dried-up Pleistocene lake bed. Water percolating downslope through lava and ash beds of the Kilimanjaro volcano saturates the lake sediments and emerges as springs in two central swamps (see map). This groundwater is very saline. The climate of the area is arid (14" - 16" of rainfall/year) and supports dry savannah grassland and bush. Until the mid-1950's, however, the lake bed had an extensive cover of stately yellow-fever trees (*Acacia xanthophloea*) which provided habitat for woodland game such as baboon, impala and leopard. After this time the fever-tree woodlands declined rapidly, especially after 1961-1962, and were replaced by a sparse cover of salt-resistant short grass and a few bushes. The woodland game were replaced by plains game such as zebra, wildebeest and kongoni.

Many conservationists blamed this destruction of the vegetation upon the nearest "obvious," traditional culprits, namely Maasai herdsmen, and pressure developed to remove them. David Western, an ecologist, did not jump to the obvious conclusion. By careful analysis of the spatial distribution of dead and dying trees, the chemical characteristics of soils



Illustrations by Donald Ryan

and vegetation, rainfall records, Maasai tradition and the writings of early European explorers, he concluded that the drastic change of habitat in Amboseli was mainly caused by a shift in the hydrology of the region.

During the period 1961-62 rainfall increased dramatically throughout East Africa, and the decade 1961-70 was much wetter than the average of the preceding 60 years. To a lesser extent 1951-52 was also a period with rainfall higher than average. During the later wet period the groundwater beneath the

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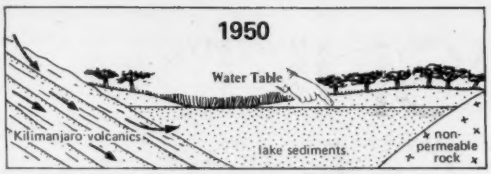
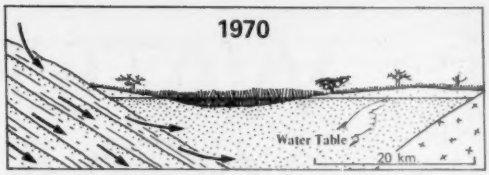
In the fall of 1977, W.A. Benjamin (2725 Sand Hill Road, Menlo Park, CA 94025) will be publishing **Water In Environmental Planning**. *Each chapter (water supply, esthetics, floods) encourages quantitative thoughts about water. "Not just rain, my dear. A ten minute light rain (less than 1/10" per hour) that caused little overland flow." There is some resistance to thinking quantities. I hope water-lovers can patiently become volume-lovers. (For water's sake, I've converted the metric system back to good ol' gallons and feet.) This article and the guide to stream health are reprinted (somewhat edited) from* **Water In Environmental Planning**. *The book can be advance ordered by writing W.A. Benjamin.*

The two authors of the book and articles are fluvial professors. Thomas Dunne, a man in his thirties, a well-educated geographer, now works part-time in Kenya on hydrology and its effects on African wildlife, and part-time as professor at the University of Washington. Luna B. Leopold is America's fluvial guru. He was Chief Hydrologist for the U.S. Geological Survey before going to U.C. Berkeley and has saturated his field with "best" books: author of **Water: A Primer** *(W.H. Freeman & Co., $2.95); co-author of* **Water** *(Life Science Lib. Time-Life Books, $9.32);* **The Flood Control Controversy** *(out of print);* **Fluvial Processes in Geomorphology** *(W.H. Freeman & Co., $14.00). A member of the line that spawned Aldo and A. Starker Leopold. Luna's name appears like John Wesley Powell's: A conservationist with great faith that science can bring reason to Nature's waterways and human government. –PW*

UMI





Amboseli lake bed rose three to four meters due to increased rainfall on the slopes of Kilimanjaro. A smaller rise was recorded in the 1950's. Invasion of the root zone by highly saline groundwater introduced soluble salts into the upper 20" of soil, causing salinization and death of the trees by physiological drought. Salt tolerant plant species replaced the woodlands.

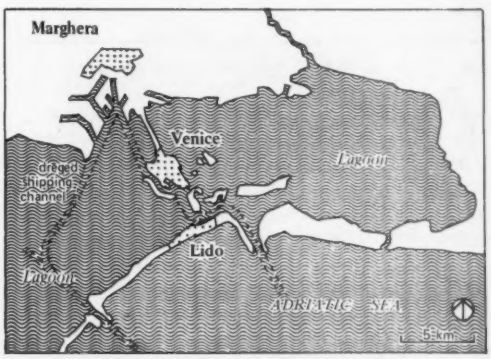
Such changes have occurred in the past, the last being before 1890 during another period of heavy rainfall. Between these wet periods, the groundwater declines and the salts are leached from the root zone by percolating rainwater. During the past decade the water table has begun to decline slightly and fitfully, and there is some recolonization by less salt-tolerant plants.

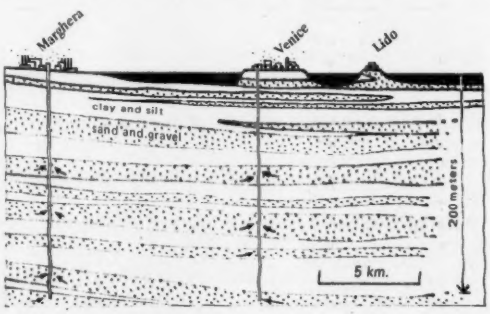
Understanding the true cause of recent changes required an appreciation of changes in rainfall, groundwater and the water budget of the park (not the Maasai). Some knowledge of the role of hydrology is necessary for developing a long-term perspective on possible future changes that might affect the park. Further rise of the water table would threaten tourist facilities or complicate sewage disposal, road construction and other developments.

SUBSIDENCE OF VENICE

IN THE FIFTH CENTURY A. D. the early inhabitants of Venice found refuge from the invading Huns on several low islands of silt and sand in a shallow lagoon in the Adriatic Sea. Venice grew into a great center of commerce and the arts, and though long past its prime it is still one of the world's loveliest cities. During the 20th century the city has experienced increasingly severe flooding problems which stem partly from natural causes and partly from changes wrought by industrial development. Storm tides now frequently inundate the famous Piazza San Marco and invade many of the surrounding buildings such as the Doges' Palace. Many of the world's finest buildings, sculptures and paintings are threatened because Venice is sinking slowly into the sea.

The northern portion of the Adriatic is sinking slowly as the earth's crust buckles under the weight of several thousands of meters of sediment brought by rivers from the Alps during the last few million years. Venice and its neighboring mainland are interconnected parts of this recent geologic sequence of unconsolidated sand, silt and clay (see sketch). These sediments contain groundwater which is exploited by pumping from wells in Venice itself and on the mainland.





In the early 20th century the growth of a major industrial center at Marghera led to heavy groundwater withdrawals which lowered the water pressure in the underlying sediments. This pressure supports part of the weight of the overlying geologic materials. When groundwater is lowered the sediments undergo compaction and the ground surface subsides. Measured rates of subsidence for the period 1952-1969 were about 4" (10 cm) in Venice and about 5.5" (14 cm) at the center of the Marghera well field. These small amounts of subsidence are critical in a setting like the Venetian Lagoon. In addition to threatening the architectural and art treasures, the small alteration of land elevation relative to the sea creates difficulties with storm drainage and the operation of sewerage systems. Partial filling of the lagoon and the dredging

Illustrations by Donald Ryan

of deep shipping channels have compounded the problem by confining the high tides gathered (by strong southerly winds in the Adriatic). The subsidence of Venice has been accelerated, therefore, at a time when tides have been allowed to penetrate farther and higher into the lagoon.

Interest arose in predicting the future impact of continued groundwater pumping. R. Allan Freeze, a hydrogeologist at the IBM Research Center in Yorktown Heights, N.Y., (now at the University of British Columbia) had developed a computerized mathematical model of groundwater flow, which allowed him to predict water pressures throughout a complicated geologic sequence under various rates of pumping. Together with other IBM research scientists (Gambolati et al., 1974) Freeze applied his model to the problem. With computed water pressures, the team could then predict the rate and extent of sediment compaction and subsidence at Venice.

If the water withdrawals at both Venice and Marghera are held constant as they have been from 1969 onward, about 1.2" (3 cm) of further subsidence could be expected in Venice by the end of this century. Even such a small change is important at a site so close to mean sea level. Complete cessation of pumping in just Venice would save about .4" (1 cm) of this subsidence. Reduction of the Marghera consumption to 75 percent of its 1969 value and cessation of withdrawals in Venice would prevent all further subsidence. Finally, closure of all wells would allow a slight recovery of elevation of perhaps .8" (2 cm) within the next 25 years as the groundwater is recharged and pressures rise again.

The land can not rise to its former elevation, however, even if the groundwater pressures recover. Most of the compaction of the sediments occurred in silty and clayey layers, which hardly expand at all once they have been compacted. Over 85 percent of the Venice subsidence is permanent.

Together, a large team of scientists, engineers, and planners contributed to a complex strategy for saving Venice and the Venetian lagoon: bringing a water supply to Marghera through a 12.5 mile (20 km) aqueduct so that groundwater pumping can be stopped altogether; protecting the lagoon from storm tides through the construction of large floating gates at the entrances to the lagoon; improved storm drainage and sewage handling and many other tasks.

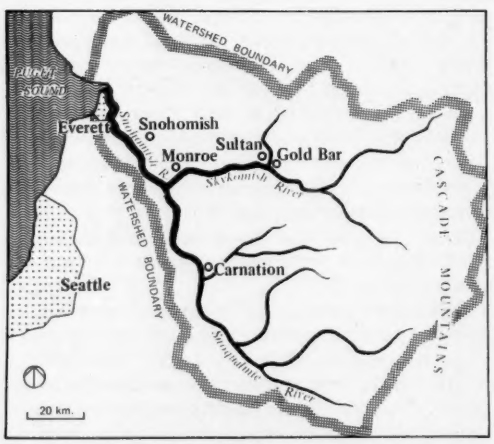
SNOHOMISH VALLEY FLOODS

DURING NOVEMBER, 1965, the Cascade Mountains of western Washington received heavy snowfall. Then in early December, a large atmospheric disturbance moved slowly across the region and funnelled warm moist air from the Pacific Ocean over the snowpack. Heavy rainfall occurred for five days and was augmented by rapid snowmelt. The result was catastrophic flooding along every major river in western Washington, the damage costs being estimated roughly at $50 million.

The flooding was greatest on the Snohomish River, which drains a 39,000 square mile (102,000 square kilometer) basin extending from the Cascade crest through the Puget Lowland to a delta at the city of Everett (please study map). The story of this flood illustrates many of the physical, economic, and social processes which the planner must understand and deal with.

The Snohomish River is formed by the junction of the Skykomish and Snoqualmie Rivers, which flow from mountainous catchments that are clothed in coniferous forest. The catchment has been heavily logged and contains a dense network of haul roads and skid trials. The valley floors widen below the locations of Gold Bar and Carnation and rich pasture and agricultural land along the rivers support a moderately dense rural population, which is served by several small towns.

It is not possible to state precisely the amount of water which the storm released over the Snohomish basin. At sea level there was no snow cover and



approximately 4" (100 mm) of rain fell in four days. Stampede Pass, with an elevation of 1200 m, near the mean altitude of the basin, received over 15-1/2" (400 mm) of rain in four days, while the warm, moist air released more than 4" (100 mm) of meltwater from the thick snowpack (see the upper part of graphs).

Large volumes of runoff generated by the storm, moved downstream as a series of flood waves. Both of the tributaries exceeded flood stage at midnight on December 1, while the main stem flooded 18 hours laters. In the steep Skykomish valley, three separate flood waves can be seen in the record, their

SNOHOMISH VALLEY FLOOD
CHRONOLOGY

The National Weather Service issued their first flood warning in the late morning of December 1, stating that the Snohomish River would rise one meter above flood stage at Snohomish by early on December 2. The county Office of Emergency Services and rescue personnel were alerted. The earliest flooding occurred by 4:00 a.m. on December 2 when towns such as Sultan (the map!) at the mouths of steep mountain tributaries became inundated to a depth of about 1-1/2 feet (half a meter).

As the flood wave gathered and moved downstream, the atmospheric disturbance slowed its westward movement. The storm lasted for a much longer time and produced more rain and snowmelt than had been expected. The National Weather Service had to keep revising its forecast of the crest upward as information on rainfall and snowmelt rates was telephoned or radioed in to the central office. By midday on December 2, for example, the forecast for the Snohomish crest at Snohomish village had been revised to 6-1/2 feet (2 m) above flood stage and eventually reached 8.2 feet (2.5 m). Similar revisions were necessary for the tributaries. Even though the flood prediction was not particularly accurate or fast, however, it was adequate to notify people that a very large flood was going to occur.

In the forested mountainous part of the catchment tens of kilometers of haul road were gullied or blocked by landslides. Large quantities of sediment were carried from the roads and landslide scars, and their surfaces were covered with a slurry of silt and sand carrying a few pebbles (2-4" in diameter). Many culverts were blocked with tree debris and the roadside ditches were flooding over and could scour a 20" (50 cm) deep gully across the road in less than an hour. Losses to the logging industry were very high.

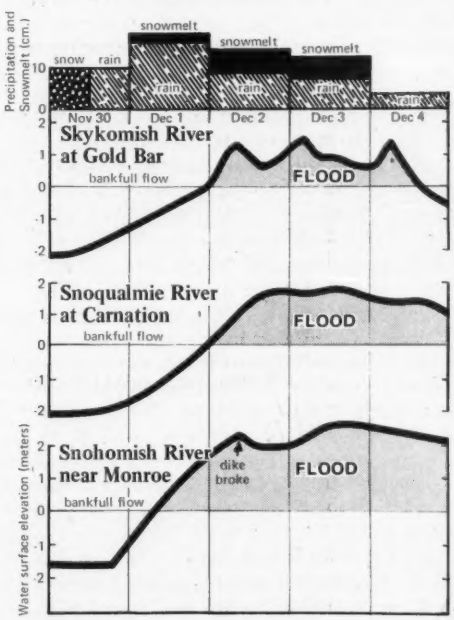
Because several towns and many farms lie in the flood-prone area of the tributary valleys there was little that could be done apart from evacuating people and animals to higher ground. This was done and although property losses and damage to municipal facilities such as sewage treatment plants were severe, they were not as catastrophic as in the lower valley.

Below Monroe, the rich farmlands were protected by flood-control dykes extending as far as the delta. The farmers felt secure behind these defenses. They went to bed without making any evacuation plans for their large dairy herds. In some places, the dykes were designed to withstand ordinary floods but to be overtopped by extraordinary floods. When overtopped, large pumping stations pumped water from the flooded fields behind the dykes back into the river. Before the dyke and pumping station had been installed, floodwaters remained on the fields for weeks. The system had operated successfully during minor floods over a 12-year period, but it now faced its first test in a large flood of the kind for which it was designed.

At 9:00 p.m. on December 2, the dyke immediately upstream of the pumping station failed, the station was undermined and fell into the river. The river level declined abruptly for a short time as water invaded the valley floor (see graphs). Over the farmlands, the water level rose 3-1/3 feet in two or three hours, isolating farmers from their cattle. The rise continued throughout the night and next day. Fifteen hundred high-grade dairy cattle plus an undetermined number of horses and smaller animals were drowned in their barns. Feed, fertilizer and machinery losses were also high, as were the costs of soaking and sediment damage in homes. The reaction of many victims was summarized by one farmer surveying his drowned herd. "We could have gotten out, but we didn't expect this." He had lived through many minor floods without suffering any great loss.

Further downstream the dykes were overtopped and breached at 40 places. More cattle were drowned in spite of hasty last-minute rescue attempts. Several thousand cattle died in Snohomish County in one day. Near the sea, high tides aggravated the problem by pouring salt water through the breached dykes. By December 4, 20,000 hectares of valley floor were under water.

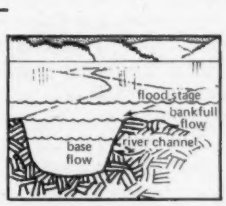
Property damage in the Snohomish Basin alone was estimated to cost $20 million; almost none of it was covered by insurance. Another $30 million was estimated as the damage costs for other basins in the state. Miles of rural roads and bridges were destroyed and the dyking and pumping system was in ruins.



Bankfull stage: The flow of a river which reaches the tops of the banks. Usually a river will equal or exceed bankfull flow 2 out of every 3 years.

Flood stage: When a river is filled to the full capacity of its stream channel and overflows its banks.

Flood wave: During a storm, water drains from all parts of the watershed towards the streams and river channel. The base flow (the flow from water held in soil and bedrock) receives the storm runoff and the river rises and flows faster. This increase is the flood wave which usually "peaks" or "crests" shortly after the rain stops. Note that the flood wave shape and peak(s) varies with watershed size, elevation, shape, drainage patterns and vegetation.



peaks reaching Gold Bar 20-30 hours after each burst of rainfall and melt. In the larger, less steep Snoqualmie basin the peaks did not respond as quickly and they were largely attenuated into a single peak which crested slightly higher above flood stage than in the Skykomish basin. At Monroe, the Snohomish rose slowly to a single broad peak 8.2 feet (2.5 m) above flood stage.

David Frank

Floodwaters invade the inhabited portion of the Snohomish valley floor.

The history of this flood has many ingredients from which a planner can learn. Considering first the physical aspects, between one-quarter and one-half of the water released by rain and snowmelt ran off as streamflow within a few days. This is a high proportion for a well-vegetated region such as the Cascades, but these large rain-on-melting-snow events are notorious throught the northern United States for producing damaging floods. The time delay between the occurrence of a burst of rainfall and the resulting peak varied from about half a day in the steep, mountain tributary above Sultan (drainage area 200 km^2) to more than two days at Snohomish. The main rivers exceeded flood stage within 36 hours of the onset of rain. These figures give an idea of the time available for warning and evacuation – if the flood warning is prompt and is taken seriously.

In spite of hasty, but well-publicized claims that this was "the 100-year flood," the average frequency with which an event of this magnitude is to be expected is about 30 years at Gold Bar and Carnation, and about 20 years for the lower Snohomish near Monroe. This flood was the "largest in history" only in the sense that since the last, larger flood, more settlement had occurred in the flood-prone area and people thought that they were secure, so they took few if any precautions.

Although detailed engineering surveys of the whole flood-prone area had not been completed, the inundated area was predictable, and it was known that many homes, barns, businesses, sewage treatment plants and other facilities were in hazardous areas.

Many claims are made that the widespread logging is responsible for the rapid runoff. There are no data to support or refute this argument for the Snohomish Basin, but it is possible to make some rough judgements based on an understanding of how water gets into streams during floods in this area, and how flood waves move downstream. It is likely that the runoff from logged areas was slightly larger and faster than that from undisturbed forest, mainly because of the catchments in other regions, it is possible to judge that the effect would be moderately high from small recently logged parcels of land. The effect would probably be reduced drastically downstream, however, as the storage function of the river channel and valley floor damped out differences between runoff from logged and unlogged areas. In large river basins, the dangerous floods are produced by large, slow-moving rainstorms which thoroughly soak the catchment and generate runoff from a large proportion of it. Over snowy regions, rain on melting snow is a particularly hazardous combination in this respect. Under these extreme conditions, differences of runoff between vegetation and land use types tends to be relatively unimportant.

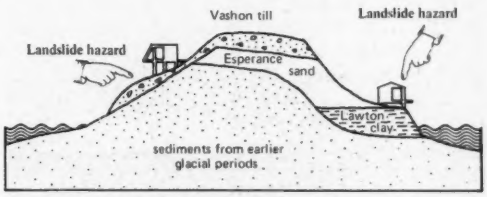
Over the preceding 15 years a major controversy had been occurring about flood control in the valley. Farmers, land developers, and the U.S. Army Corps of Engineers want to build a flood control dam on a major tributary of the Snoqualmie River. It is thought that in addition to protecting farmland, the flood control facilities could be used for water sports, and that land values would be enhanced by an influx of recreational and permanent houses. Their plan is opposed by a coalition of conservationists, kayakers, fishermen, some valley residents and other groups. Immediately after the flood, local newspapers carried editorials and letters demanding more flood control. How should the planner assess the arguments? It is a sad fact that the state and federal agencies concerned with hydrology provided no technical guidance to the public when this clamour arose again, even though the proposal for the dam never claimed that the dam would make any significant reduction of flood levels in the Lower Snohomish Valley, where the bulk of the damage occurred. The idea was fostered in the public's mind that the damage could have been avoided if only the selfish conservationists had allowed a dam to be built.

After the flood many planners in the region were left again to ponder the wisdom of trying to control floods by means of dykes or dams and thereby encouraging people to settle in the supposed safety of the "protected" area. Even farmers who had been perceptive enough to evacuate their animals in earlier floods were lulled into a false sense of security by the knowledge that the government agencies were protecting them.

LANDSLIDES IN SEATTLE

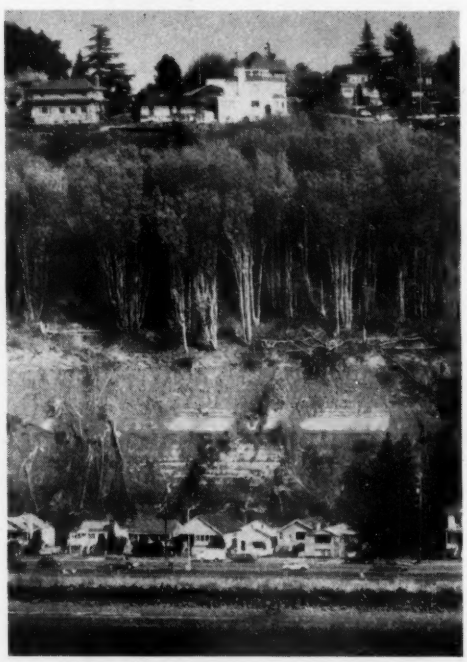
DURING THE LAST glacial period (25,000 to 10,000 years ago) the lowland around Puget Sound in northwest Washington underwent a complex history of geologic change. A hilly landscape produced by earlier glacial and river erosion and deposition was inundated by a rising lake when a large glacier extended south along Puget Sound from British Columbia and blocked drainage to the sea. In this lake, streams from the flanking Olympic and Cascade Mountains deposited fine silt and clay which is now called the Lawton Clay (see sketch). As the glacier moved up the Sound, streams carried sands from its extending front and deposited them over the clay as the Esperance Sand. The ice then advanced over the fluvio-glacial deposits, carving them into hills and valleys, and plastering sandy and gravelly till over the landscape, as shown in the geologic cross-section. After the ice retreated into Canada, the rising sea entered Puget Sound and wave action steepened the edges of the hills into cliffs.

Around the Puget Lowland the juxtaposition of steep hillslopes and contacts of permeable sands over impermeable silts and clays creates conditions that favour landsliding. Water percolating through the permeable till and sand following heavy rain is impeded by the lower strata and water pressure builds up, weakening the unconsolidated sediments to the point of collapse. The process is most common in the two situations indicated in the sketch, which are also among the most highly prized residential sites offering magnificent views of the snow-covered Olympic and Cascade mountains.



In some parts of the Seattle region the landslide problem is aggravated by poor grading and drainage practices on residential lots. Artificial fills placed on impermeable substrates are often rendered unstable by the build-up of water pressures. Diversion of stormwater onto slopes has a similar effect. Undercutting of hillsides for roads and house lots triggers other slides.

[more →]



Here are three sites in which hillside failures threaten buildings. At the top of the upper cliff the threat is undermining. During the spring of 1974, a sidewalk running along the edge of the upper cliff in the photo was undermined, and the white house lost one-quarter of its garden. The failure has continued slowly since that time.

Second, the bench in the figure is covered by a dense growth of young maple trees and several feet of structureless light material is visible in the cliff immediately below them. This material is the Esperance sand landslide debris in transit across the bench. In spite of its instability, the bench shown in the picture has been surveyed for a large residential complex, and some electrical utility cables and lamp standards were actually installed before the ground motion accelerated in early 1974 and the building permit was withdrawn. Elsewhere in Seattle, this bench is a favourite building site and houses suffer direct damage from landslides, as well as the problems arising from the more subtle ground movements across the bench.

The third hazardous site, of course, is at the foot of the lower cliff which receives the landslide debris and trees that have traversed the bench. In 1974 several houses were destroyed by this process, and some of the debris is visible in the photograph. There are no vacant lots visible, however, because the destroyed buildings were replaced within a year by new houses, apartment buildings and a condominium.

Donald Tubbs, while a graduate student in Geological Sciences at the University of Washington, studied the spatial relationship of landslides to the pattern of geologic contacts. He was able to define and map zones with various degrees of landslide hazard. His map is a valuable guide to local planners, engineers and homeowners. The timing of major episodes of landsliding was also related to precipitation patterns and a rainfall index suitable for short-term warning of high landslide risk was developed by Tubbs from a statistical analysis of 30 years of landslide reports and weather records. The study has been widely publicized in Seattle and has been used in developing new grading ordinances, distributing building permits and designing site plans for parks and residential developments.

In spite of a generally high level of awareness of the landslide hazard among long-term residents of Seattle, however, a considerable amount of building continues to occur in high-risk zones. A large residential development has recently been built on the bench at the contact of the Esperance Sand and the Lawton Clay. Excavation of old landslide debris at the site is now beginning to trigger renewed hillslope failure which is piling wet debris against the uphill side of the buildings. Maintenance problems are increasing and a lawsuit has been filed by the upslope landowner claiming his property has been undermined.

CHANNEL CHANGES ON THE YAKIMA RIVER

IN SOUTHWESTERN WASHINGTON, the Yakima River flows in a steep, divided channel through a set of gaps cut in bedrock and across intervening valleys floored with coarse gravels (see map). It drains 3,000 square miles (8000 sq. km.) of the Cascade Mountains and its snow-fed discharge (the mean annual flow is 25 ft^3/sec or 72 m^3/sec) is the basis of irrigated agriculture in the lower, arid portion of the basin. Near the town of Yakima a plan was proposed to convert the valley floor into a park 7 miles (12 km) long and 1.2 miles (2 km) wide. Because the park was to be intimately associated with the river, Grant R. Jones, the landscape architect and environmental planner responsible for the park, recognized the need for understanding why the river looks and acts as it does.

During the past 12 - 15 million years the valley had a history of earth movements, deposition of volcanic lavas and ashes, and erosion by the river which resulted in the alternation of parallel lava ridges and in intervening gravel-floored valleys. During the Pleistocene epoch (2 million to 10,000 years ago) glaciers advanced into the upper part of the valley and the river was swollen with glacial meltwater. Large quantities of gravelly sediment were deposited in the valleys. After the glaciers retreated the river cut down about 10 feet (3 m) into its Pleistocene deposits leaving a terrace of sand and gravel along both sides of the valley. This terrace now defines a natural corridor within which floodwaters are confined.

Examination of the geologic and topographic maps suggested that the valley is tilting towards the south in recent geologic time and that this movement continues. During the last 15,000 years the river cut down into the northern half of the park reach at a faster rate than to the south. In the northern section, also, the river has undergone less lateral shifting than the southern part of the reach which has a more

The Yakima River Valley. Earlier positions of the braided river channel show as light streaks of sand and gravel. Vegetation strips outline some of the abandoned channels.

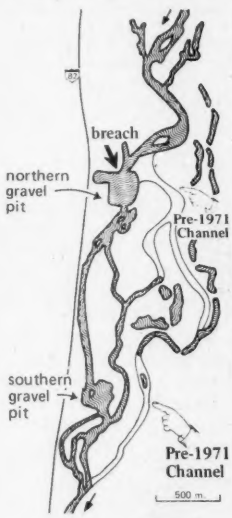
complicated channel with signs of recent deposition of channel bars and natural levees.

Divided channels of the kind found along the Yakima are called "braided" channels. They generally form within a narrow range of geologic and hydrologic conditions. They operate in ways that are predictable within broad limits. These braided

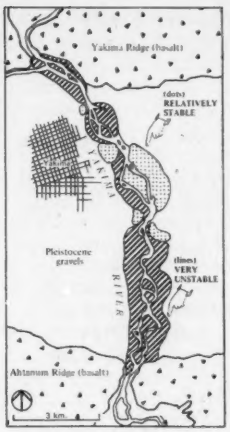
channels place severe constraints upon development along the valley floor.

Aerial photographs of the valley reveal many abandoned channels indicating that the Yakima has swept across its whole valley in the recent geologic past. Four sets of aerial photographs were available from 1939 to 1973 and from them the successive positions of the river channels could be mapped. The maps showed the river channel to be very mobile. During the 34-year measuring period the average rate of lateral migration was 33 feet/year (10 m/year). Superimposed upon this gradual shifting, however, is a more dangerous and less predictable type of movement in which the river overtops its bank and cuts an entirely new channel, 400 - 1000 feet (100 - 300 meters) from its earlier course.

Channel diversion is a natural process along a large, fast river with weak bank materials, but in the vicinity of Yakima it has been accentuated by gravel mining in the valley floor. Deep gravel pits are excavated and after abandonment they are isolated from the river by only a weak gravel dyke, which the river can easily breach. The detailed map shows a case where gravel has been excavated from two pits for the construction of an interstate highway. In 1971, the river invaded the upper gravel pit, flowed out of the back of the excavation and reentered the main channel via a second pit, 5,900 feet (1,800 m) downstream. Overnight, the river was diverted up to 2,000 feet (600 m) to the west, and is now cutting into the embankment under the highway.



Although it is not possible to predict such channel behavior with confidence, it was possible to produce a map of the "worst case" of channel migration during the next 10 to 25 years. Careful field examination of the channel banks, some artificial dykes, and the microtopography of the valley floor made it possible to locate sites at which the river will probably break out of its channel and take a new course sometime this century (see Yakima map). Some were obvious and the path of the river after diversion could be easily foreseen. A few were more equivocal. After the probable diversions were mapped, recent directions and rates of gradual shifting were projected over the next 25 years and the hazard zone was defined on this basis. Most of the predicted movement lies in the southern reach. The resulting map allowed the classification of the valley floor into stable and unstable zones as one basis for siting facilities.



As another design constraint, the flood hazard was defined with the aid of an 80-year record of discharge on the river. The construction of several irrigation-supply dams has resulted in a slight reduction of flood hazard in the valley since 1933. Settlement has moved onto the valley floor encouraged by the flood-control provided by the dams and by some dykes in the less-active, northern part of the reach. There has not been a major flood since the settlement occurred but the map of the flood hazard indicates that such an event would inundate homes. In 1975 a moderate flood (the "ten year" flood) caused minor damage.

The river transports an average of 250,000 tonnes of sediment per year past this site. This is a low rate for a river of its size. Nevertheless, it is important that the sediment transport processes not be interfered with by any kind of engineering works. Obstruction of the flow would lead to rapid sedimentation and diversion of the channel. The quantity of sediment in motion is also important in the evolution of the river channel once it has been diverted into a gravel pit.

Although the dykes can temporarily confine floodwaters, they provide little insurance against the movement of the channel itself, because the river can move the rocks of which the dykes are built. A combination of hydraulic equations and field observation after a 10-year flood showed that the river could dislodge boulders up to 2 feet to 3.3 feet (0.6 - 1.0 m) in diameter. The dykes along the river are protected by rocks much smaller than this and have already failed or have been disturbed in several places. Current proposals to extend the dyking system from the naturally more confined northern reach into the rapidly shifting southern part of the valley do not seem wise in view of the river's strength.

The planning team led by Grant R. Jones used the report on geomorphology and hydrology, and particularly the map of relative channel stability as a basis for partitioning the valley floor into segments which could be used for a wildlife refuge, passive recreation, active recreation, and a visitor center. Some other land use proposals for parts of the valley, such as the siting of a motel and trailer park were seen to be unwise in view of the flood hazard and recent rates and directions of channel migration. The proposed motel site has since been isolated from the interstate highway by a channel diversion. ■

ANOTHER WATERSHED VIGNETTE: LAKE TAHOE, CALIFORNIA

by Peter Warshall, J.T. and Carin Winneberger

The Lake Tahoe Watershed is high in the Sierra Nevada on the California-Nevada border. The basin is 506 square miles – 314 are land; 192 are lake surface. It has that beautiful blue of very deep waters (average depth is 990 feet) and has remained almost as clear as the day Col. John Fremont submerged a white, porcelain plate 89 feet before he lost sight of it. Colonel Fremont was the first Euro-American to see Lake Tahoe (1844) but it wasn't until 1868 (transcontinental railroad) that immigrants began to live in the Tahoe basin. From 1870 to 1900, the whole watershed was logged heavily. But, from 1900 to the 1950's, only a small recreation business inhabited the lake's shores. During the 1950's, the present-day cultural landscape formed: condominiums, ski lodges, hotels, and gambling casinos on the Nevada shoreline. Today's resident population is about 35,000 (1970).

During the late 50's, environmentalists, developers, government agencies all became worried. Won't so many people cause "eutrophication?" – a big word meaning enrichment of waters by nutrients. Eutrophication would change that prussian blue to lime green as algae thrived on the nutrients, fish might die, the shoreline would look terrible and swimmers, boaters and sight-seers would go some other place.

The South Tahoe Public Utility District governs over half the developable land in the Tahoe watershed. Starting in the 1950's, STPUD began upping the scale of sewage treatment technology to keep pace with development and prevent feared eutrophication.

1951: STPUD replaces two redwood septic tanks with underground soil disposal by a 2-1/2 million-gallon/day activated sludge treatment plant. Treated wastewater ("effluent") is sprayed on top of the land.

1965: A "tertiary" treatment plant is added to the activated sludge. The "tertiary" treatment uses chemical coagulation (to get rid of solids), filtration through multi-media filters, and adsorption on activated carbon (to remove phosphorous). Despite this hi-tech treatment with high quality water, STPUD decides to export all the wastewater from the Lake Tahoe Watershed. Underground or spray irrigation disposal (using soils as filters) is abandoned. The export system is a 14 mile long pipe over a mountain pass 1/2-mile high and down to another watershed (Indian Creek) which is dammed to hold the highly treated effluent.

1965: The same year, the 2-1/2 million gallon/day treatment plant fails because Tahoe development is producing 4 million gallons/day.

1966: The whole treatment facility is expanded. The resulting sludge (from coagulation and settling) is so great that incinerators and special hearth to reclaim the lime are added.

1968: To make sure that the quality of the exported water was practically drinking water, a Stripping Tower that removes nitrogen (in Ammonia form) is added.

Somehow, in twenty years, BIG and SUPER-TECH took over any reasonable perspective on controlling eutrophication.

To get a watershed perspective, step back a moment and consider the nitrogen aspect of eutrophication (phosporus and carbonaceous materials are equally important). The nitrogen removal from Tahoe sewage was to be a model plant: a 47 foot high tower in

Ammonia Stripping Tower at Tahoe Sewage Plant

which ammonia-nitrogen was released into the atmosphere by blowing air through the wastewater. It cost, just for materials, about $350,000 (1969 dollars) and about $30,000 to operate each year (pumps, fans, cleaning and personnel).

From the point of view of total watershed thinking, it is known that nitrogen, especially ammonia-nitrogen returns to land and water naturally in rainfall. Ammonia-nitrogen also dissolves in water as it passes over the surface of ponds and lakes. So, the ammonia released by the Tahoe Stripping Tower returns immediately to the watershed. In one of the great boondoggles of hi-tech worship, sanitary engineers built an incredible machine to return ammonia exactly to the place they wanted to keep it from. The objective (to remove all kinds of nitrogen from Lake Tahoe) was totally forgotten because the sanitary engineers got so involved in the technology needed to remove nitrogen from sewage that they lost the Big Picture.

Think of the boon-doggle. Tertiary treated wastewater is both expensive and extremely high quality (the best). All solids, color, odor and bacteria are removed. Ninety-eight percent of the detergents, phosphorous, biological oxygen demanding materials are removed. But, instead of keeping this water in the Lake Tahoe watershed where it fell, STPUD exports its "drinking" quality water 14 miles at incredible expense.

In addition, seventy-five percent of the nitrogen produced in Lake Tahoe sewage could have been removed by percolating the partially treated sewage through 200 to 300 yards of soil. Somehow, the biochemical ability of soil and plants to hold, use, and transform nitrogen compounds back into atmosphere ("denitrification") was fogotten.

Finally, will exporting treated wastewaters, but continuing developing, significantly effect eutrophication? Think of all the sources of nitrogen. The ever increasing "disturbed" land (buildings, roads) in

Tahoe release twice the amount of nitrogen as undisturbed areas. Lawn fertilizers, auto emissions, lightning, cows and horses add still more to the nitrogen from the Stripping Tower. Paving, which causes more runoff, causes more nitrogen to leach into the streams. Finally, moisture laden air moving in from the Pacific, passes over San Francisco and the heavily developed Central Valley. Before it falls as rain or snow on the Sierras, it has picked up nutrients from the "air shed" of 4 million urban dwellers, fertilizer from the dust of thousands of acres of windswept agricultural soil as well as naturally released nitrogen by plant life. Lake Tahoe receives nitrogen in rain, snow, and runoff equivalent to a population (with partially treated sewage) of 66,700 people.

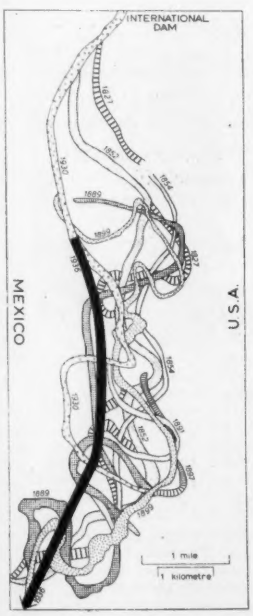
In summary, sewage, a result of human activity, is about 60% of the nitrogen budget of Lake Tahoe which partly is exported in wastewater and partly returns through the Stripping Tower. Nature provides only about 10% because soils, algae and plants use the nitrogen in rain and snow. Other human activities (cars to pavement, local to regional air) adds 30% more nitrogen that is not controlled in any way. Sewage is but part of the eutrophication problem of Lake Tahoe. Exporting sewage was hardly the total cure. As far as nitrogen is concerned, the problem could have been handled within the watershed, more cheaply and more efficiently, by using the Earth's best filter, chemical renovator and biological recycler – soil. ■

Water, Earth and Man

This is the best semi-technical introduction to watersheds and human life. Chapters range from "The Drainage Basin as an Historical Basis for Human Activity," to "The Role of Water in Rock Disintegration" to "The Human Use of Open Channels" to "Periglacial Morphometry" to "Human Responses to River Regimes" to "Long-Term Precipitation Trends" to "Overland Flow and Man." There is material on primitive irrigation, benefit-cost analysis, inselbergs, pediments and Tors, man's affinity for floodplain occupancy. . . . on and on. Some of the contributors (like Rosemary More) are fine writers. Others seem to thrive on polysyllabic latinate techno-locution. Throughout this issue is material learned from **Water, Earth and Man.** *—PW*

Water, Earth and Man
(A synthesis of hydrology, geomorphology and socio-economic geography)
Richard J. Chorley
1969; 580 pp.
$27.50 postpaid

from:
Barnes & Noble, Inc.
Harper & Row
Weystone Industrial Park
Scranton, PA 18512
or Whole Earth



The Rio Grande near El Paso/ Ciudad Juarez showing some of the main shifts in the major channel from 1827 to 1936.

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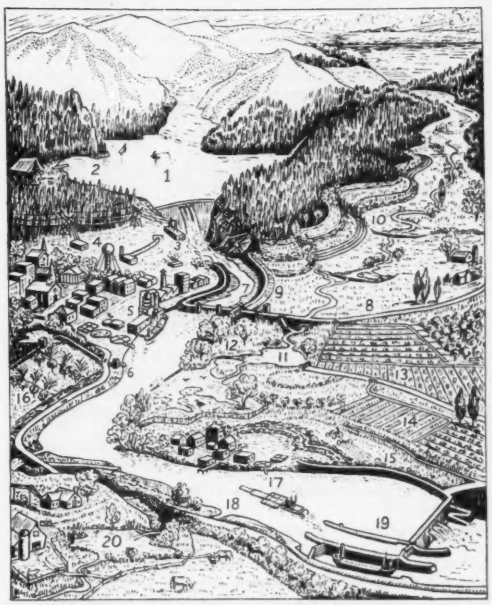
The advantage that a river is easily recognizable as a boundary is in well-populated districts usually offset by three main drawbacks. First, most rivers naturally change their courses, especially where they meander and suffer violent floods; second, improvement of a river channel for navigation, etc., and withdrawals of water from it for irrigation, etc., affect both banks; and third, floodplains and flat riverine land attract settlers to both banks.



Model for multiple-purpose integrated river basin development.

1. Multiple-purpose reservoir.
2. Recreation; swimming, fishing, camping.
3. Hydroelectric station.
4. Municipal water supply.
5. City and industrial waste treatment plant
6. Pump to equalizing reservoir for irrigation.
7. Diversion dam and lake.
8. High-level irrigation canal.
9. Levees for flood control.
10. Erosion control: stream dams and contour terracing.
11. Regulating basin for irrigation.
12. Wildlife refuge.
13. Low-level irrigation canal.
14. Gravity irrigation.
15. Contour ploughing.
16. Sprinkler irrigation.
17. Community water treatment plant.
18. Navigation: barge trains, locks, etc.
19. Re-regulating reservoir with locks.
20. Farm pond with pisciculture.

•

Ocean volume is equivalent to oceanic evaporation during about 3,000 years, which might be taken as the average residence time of a water molecule in the ocean. Some molecules reside only for an instant, however, and water in great ocean deeps may be out of the water cycle during many thousands of years.

Water

The most elementary of Luna Leopold's trio. Since there are no nontechnical books on watersheds, **Water** *is on water. But there is enough of water/soil/plant togetherness and enough fine photos to make* **Water** *the headwaters text.*

—PW

Water
Luna B. Leopold
and Kenneth S. Davis
1970; 196 pp.
$9.32 postpaid

from:
Time-Life Books
Little, Brown & Co., Inc.
200 West St.
Waltham, MA 02154
or Whole Earth

Water usually forms landscape not so much by dissolving earth as by carrying it as waterborne debris. Rain tears away at the earth's surface with a power that is astonishing. The power of the drops striking one acre in a heavy rain of one inch per hour is equivalent to that of a 100 horsepower automobile engine running at top speed. A very heavy rain — two inches an hour — expends enough energy in one hour to lift a seven-inch layer of that acre 258 feet into the air.

Each raindrop is a miniature hammer, breaking off minute fragments from the hardest rock. Striking loose dirt, it gouges holes and splashes particles into the air. The water collects other particles within itself, forming a muddy suspension that often clogs the surface pores of the ground. This puddling prevents the rain that follows from sinking into the ground and causes it to accumulate in sheets over the surface. In a pelting rain, the sheets of water are churned, greatly increasing the capacity of the subsequent runoff to dislodge, lift and transport soil and rock materials. These materials further augment erosion by acting as abrasives that scour and cut the ground. The runoff trickles its bit of the land into the nearest streams. The streams tear at their courses and dump their burden into the river. The river continues the process. From the stuff of mountains and foothills the river constructs the lowlands — the floodplains, the broad alluvial valleys, the delta thrusting into the sea.

Two High-Tech Books

Normally, I would not review these books as they require either advanced math or an ability to read between the advanced math. But, they are the best hi-tech books related to watersheds.

Hillslope Form and Process *focusses on the "dynamic equilibrium" of the slope profile: upheaval vs. denudation. How water and gravity cause land to heave, to slide and flow.*

Handbook of Applied Hydrology *is the "Brittannica" of water-resources technology. Oceanography, floodplain adjustments, fluid mechanics, drought, reservoir regulation, statistics, plant ecology, glaciers . . . on and on. Very few readers will want (be able to afford) these books. But, keep them in mind for your local library.*

—PW

Handbook of Applied Hydrology
(A Compendium of Water Resources Technology)
Ven Te Chow, Ed.
1964; 1418 pp.
$45.00 postpaid
from:
McGraw-Hill Book Co.
Princeton Road
Hightstown, NJ 08520

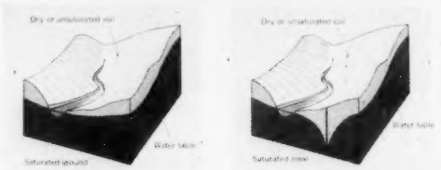
Hillslope Form and Process
M.A. Carson and M.J. Kirkby
1972; 475 pp.
$23.50 postpaid
from:
Cambridge Univ. Press
510 North Ave.
New Rochelle, NY 10801

Water: A Primer

This is the mid-level of the Leopold trio. A very serious introduction to basic vocabulary and concepts of rain-runoff-erosion-evaporation cycle. Fine diagrams. More examples from "true life" would decrease textual dryness.

—PW

Water
(A Primer)
Luna B. Leopold
1974; 172 pp.
$4.50 postpaid
from:
W.H. Freeman & Co.
660 Market St.
San Francisco, CA 94104
or Whole Earth

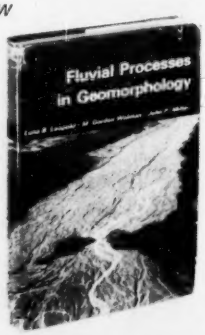


Effects on a water table of pumping a well.

Fluvial Processes in Geomorphology

Fluvial Processes *is the "classic" introduction to geomorphology (landform and its evolution). It is technical, well-illustrated and clearly written.*

—PW



Fluvial Processes in Geomorphology
Luna B. Leopold, M. Gordon Wolman & John P. Miller
1964; 522 pp.
$14.00 postpaid
from:
W.H. Freeman & Co.
660 Market Street
San Francisco, CA 94104
or Whole Earth

Three modes or physical processes of drainage extension can be cited: (1) surface runoff; (2) subsurface seepage; and (3) headward erosion of scarps or headcuts. Under conditions of surface runoff new first-order channels form where declevity, length of slope, and rainfall intensity create runoff capable of producing shear stresses that exceed the threshold of erosion of the soil. When this happens, the surface cover is broken and rills develop. This process is common on bare roadcuts and on badly managed farmlands. Under such conditions a rill channel may open up anywhere on a slope where local conditions are favorable, and the openings so formed may proceed downslope to already established drainage lines or upslope toward the divide.

The Hydrologic Cycle and the Wisdom of God

A concise history demonstrating how science, myth and the imagination weave our visions. A decidedly Occidental (Greek and Hebraic) view of the water cycle (vapours, oceans and rivers) from the late 1600's till Darwin stepped in. Only God knows what the shower curtain means to modern man.

—PW

The Hydrologic Cycle and The Wisdom of God
(A Theme in Geoteleology)
Yi-Fu Tuan
1968; 158pp.
$5.00 postpaid
from:
University of Toronto Press
Front Campus
Univ. of Toronto
Toronto M5S 1A6
Ontario Canada

Before the Darwinian thesis took hold, to educated Europeans nature appeared mainly in two aspects: as God's creation and therefore infinitely pliable to the exigencies of His mood, and as God's creation and therefore reflecting, however dimly, His own perfection. The first aspect shows God as the omnipotent law-giver. Both man and nature are subject to His wrath, a fact reflected in the list of cataclysmic events in both earth and human history. The second aspect reveals God as eternal wisdom, symbolized by the circle. These two world-views are deeply rooted in the ancient civilizations of the eastern Mediterranean. We may label the one Hebraic and the other Greek. They have never been successfully reconciled. In the same author, and indeed often in the same book, they appear incongruously side by side. The stars in their unchanging circular courses display the wisdom and eternity of God. The earth, however, reveals a Creator who has been obliged to interfere, from time to time, with the course of nature by special decree.

In the second half of the seventeenth century the circle of perfection still had its supporters although it was widely rumored to be out of shape. The planets no longer have circular courses but a Cambridge mathematician, even as late as 1696, could still assert that all the planetary orbits are either truly circular or "not very much different from the same." The end of the seventeenth century was also a time when the geometric harmonies of the earth were being vigorously advocated. One could not claim the earth as possessing the harmony of a perfect sphere; the mountains and seas plead too obviously otherwise. But one could claim for the earth a sort of higher harmony based on the concept of the hydrologic cycle. We have seen how this claim was persistently pursued until the middle of the 19th century.

Drainage of south-east Kent as symbolized by a half-kneeling man, from a manuscript map in the Ankographia *by Christopher Packe (London, 1737).*

Mystic Watershed: Out of Print

Feng-Shui *by E.J. Eitel, Cambridge Univ., 1973 (first published 1873). A clergyman, enamoured with Western Science, honest enough to report his study of feng-shui ("wind-water") while in China.*

—PW
[Suggested by Jon Goodchild]

The science of feng-shui, its nature and purpose have scarcely been recognized in western countries that no longer possess a comparable tradition, nor has the subject seemed of any practical importance, having no contribution to make to the progress of material technology. Yet in times when the quality of civilization was judged by its attainments of stability and social harmony, feng-shui, the 'science of wind and water' was an indispensible feature of daily life. For it was considered that only by means of this science was it possible to establish a settled civilization with harmonious relations between people and their natural surroundings.

•

We now come to the third division of the system of feng-shui, the doctrine of nature's breath. Nature, as I have had occasion to remark before, is looked upon by the Chinese observer as a living breathing organism, and we cannot be surprised, therefore, to find the Chinese gravely discussing the inhaling and exhaling breath of nature. In fact, with the distinction of these two breaths, the expanding breath, as they call it, and reverting breath, they explain almost every phenomenon in nature. Between heaven and earth there is nothing so important, so almighty and omnipresent as this breath of nature. It enters into every stem and fibre, and through it heaven and earth and every creature live and move and have their being.

•

Water is in the Feng-shui system always looked upon as the emblem of wealth and affluence. Where the water runs off in a straight course, it will cause the property of people dwelling there to run off and dissipate like water. Tortuous, crooked lines are the indications of a beneficial breath, and will serve to retain the vital breath where it exists.

Round River: from the Journals of Aldo Leopold

Here is more simple, straightforward prose of America's gentlest (last?) twentieth century naturalist-hunter-conservationist. (Sand County Almanac, *the "classic," was reviewed CATALOG p. 13).* *—PW*

Round River: from the Journals of Aldo Leopold
Luna B. Leopold, Editor
1958; 173 pp.
$1.95 postpaid
from:
Oxford University Press
16-00 Pollitt Drive.
Fair Lawn, NJ 07410
or Whole Earth

Deadening

The old oak had been girdled and was dead.

There are degrees of death in abandoned farms. Some old houses cock an eye at you as if to say 'Somebody will move in. Wait and see.'

But this farm was different. Girdling the old oak to squeeze one last crop out of the barnyard has the same finality as burning the furniture to keep warm.

•

One of the marvels of early Wisconsin was the Round River, a river that flowed into itself, and thus sped around and around in a never-ending circuit. Paul Bunyan discovered it, and the Bunyan saga tells how he floated many a log down its restless waters.

No one has suspected Paul of speaking in parables, yet in this instance he did. Wisconsin not only *had* a round river, Wisconsin *is* one. The current is the stream of energy which flows out of the soil into plants, thence into animals, thence back into the soil in a never-ending circuit of life. 'Dust unto dust' is a desiccated version of the Round River concept.

•

Clarence rode up into the Blue in search of a pair of spurs. He failed to find the spurs but killed a big buck and saw several turkeys. Also found the carcass of a big colt that was clearly a fresh lion kill. It was covered with grass and limbs in good lion style. No traps in camp.

Watershed Planning: A Selected Bibliography

569 selected references focussed on river basin planning and regional wastewater treatment planning. They are compiled from Smithsonian Science Info. Exchange Literature Search, the National Technical Info. Service (NTIS) and by the author. They are planning references more than overviews of ecology, geomorphology, nutrient cycling, etc. —PW

Watershed Planning: A Selected Bibliography
(Exchange Bibliography 1014)
Frank Kudrna
1976; 57 pp.
$5.50 postpaid

from:
Council of Planning Librarians
Mrs. Mary Vance, Ed.
P.O. Box 229
Monticello, IL 61856

Residential Water Conservation

This book replaces all previous books. An excellent history of attitudes towards water consumption and changing technology; a cross-section of typically American water use; dozens of home devices to save water; how water districts can encourage or discourage water wastage through different billing devices; a huge annotated bibliography and directory of manufacturers.

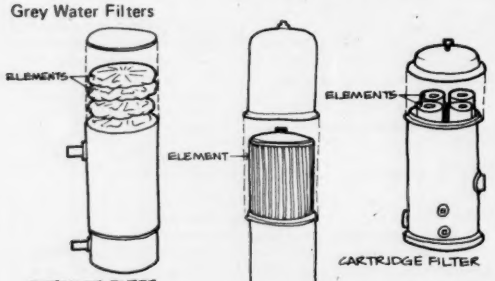
The book to connect your body plumbing sensibly to Nature's plumbing. Save a river! Halve consumption rather than doubling demand.

—PW
[Suggested by Jonathan Katz, first among others]

Residential Water Conservation
Murray Milne
1975; 468 pp.
$7.50 postpaid

from:
California Water Resources Center
University of California
Davis, CA 95616

Grey Water Filters



Architects and urban planners can directly influence residential water conservation by the way they design homes and plan cities. However, most of these professionals are completely unaware of the extent to which their work is shaped and influenced by the demands of the water supply and sewage collection systems that are interlaced invisibly through almost every part of their work. . . .

Among our oldest surviving architectural monuments are the ancient and exquisite Roman aqueducts which helped to change forever the face of Europe and Asia. The construction, maintenance, and defense of a water supply system of this magnitude required the development of a highly organized and well disciplined society. Mankind has shed much blood in the defense of water. In our own country, shoot-outs at the old water hole were overshadowed by the bombings and private armies attending the construction of the huge water projects that have changed Southern California from a desert to a lush megalopolis.

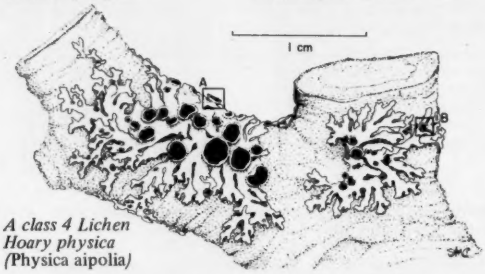
A Guide to Air Quality Monitoring With Lichens

When air is polluted, lichens disappear. This is a key to the sensitive lichen and how to watch trees for signs of pollution. It is best suited for the Pacific Northwest but some key species are widespread. The beginnings of replacing machines with equivalent living creatures.

—PW

A Guide to Air Quality Monitoring With Lichens
William Denison
1973; 40 pp.
$3.00 postpaid

from:
Lichen Technology
P.O. Box 369
Corvallis, OR 97330



A class 4 Lichen
Hoary physica
*(*Physica aipolia*)*

In evaluating the air quality of a site, one should note the most sensitive lichens present (those of the highest class), because they indicate the air quality at that site. If no lichens are present, the air is very dirty. If only Class 1 lichens are present, the air quality is only slightly better. However, if all classes of lichens are present, including the very sensitive Class 4 lichens, then the air is very clean.

Water conservation

It takes 1 - 2 tons of water to make 1 ton of bricks; 250 tons of water for each ton of paper; 600 tons of water for each ton of nitrate fertilizer; 1,500 tons of water for each ton of wheat; 4,000 tons of water for each ton of rice; 10,000 tons of water for each ton of cotton . . . add this up with home use, we reach over 1,500 gallons per person each day to eat, drink, wash, flush the toilet and read the newspaper. Home water conservation, especially eliminating the 5-gallon flush toilet, is a way you can help keep watersheds intact and new dams from being built.

This soft-cover booklet is very specific to California. But, California being "water-short" and development heavy, is the leader in water conservation efforts. **Water Conservation In California** *gives the best overall analysis of agricultural water use and re-use and conservation potential in print.*

—PW

Water Conservation in California
Bulletin No. 198, May 1976
State of California
Free

from:
Dept. of Water Resources
P.O. Box 388
Sacramento, CA 95802

Depending on the circumstances in each case, agricultural irrigation efficiency may be increased by changing to sprinkler or drip systems, improving operation of existing systems (including better irrigation scheduling) and improving other aspects of farm management. Irrigation water use may be reduced by selecting low-water-using crops, and in some cases, by actions to reduce plant consumptive use. Water districts can save water by lining ditches and canals and assist farmers in becoming more efficient by following more effective water delivery schedules. The opportunity for water savings in an area depends on how much outflow is needed to maintain salt balance and the disposition of the excess applied water, i.e., whether it is reused, or disposed of into bodies of saline surface or ground water.

The Wetlands Project

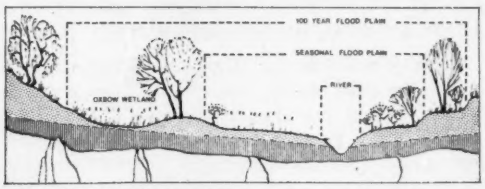
c/o Massachusetts Audobon Society
Lincoln, MA 01773

The Wetlands Project exists to help townspeople protect their marshes, ponds, streams, swamps, floodplains – anything in Nature that holds water. Their written materials are a pleasure to read no matter where you live. If you dwell in the northeast forest bioregion, they can help with anything from wetland education to wetland government.

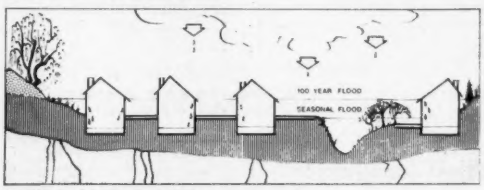
Wetlands and the Water Cycle (24 pp; 1 copy free; 2 - 50 copies, $ .25 each). Clear thoughts and vision, as water when the brook runs deep. –PW

Wetlands and Flood Plains On Paper (28 pp; 1 copy free; 2 - 50 copies, $ .50 each). The process of flood plain and wetland mapping – all kinds.

Annotated Wetland Bibliography ($1 each).



The undisturbed floodplain . . .



is filled and developed, but continues its natural flood.

•

Somewhere between eleven or twelve thousand years ago, the great ice sheet that covered the northern half of the American continent began a gradual retreat. As it slowly melted back from its southernmost point it left behind a legacy of lakes and ponds on the channeled and sculptured landscape. . . .

Even before the last remnants of the glacier had melted from the valleys, the myriad lakes and ponds that were left strewn across the landscape began to evolve into fresh-water swamps, marshes and bogs. Most of these wetlands are found along the flood plains of rivers and streams or in spots of low elevation. However, because of the sealing nature of bedrock and till, some may be found perched high on the sides of hills, or even on mountain tops. . . .

In general, wetlands can be identified by their vegetation and can be separated into three commonly recognized classes, each of which represents a former pond in varying stages of death. If the predominant vegetation consists of grasses, sedges or rushes and there are no trees, the wetland is a marsh. If there are trees and shrubs it is a swamp, and if the area is covered with thick layers of spongy sphagnum moss and is filled with slow flowing or stagnating water, the wetland is a bog.

REPRINT THIS BOOK!

Vegetation and Watershed Management: An Appraisal of Vegetation Management in Relation to Water Supply, Flood Control and Soil Erosion, by E.A. Colman, 1953, 415pp, Ronald Press Co., New York, NY.

Colman's book is an easy-to-read classic. It wanders through forests, cropland and range saying; "management of watershed lands is as important as the control of water in streams and groundwater basins."

Guidelines for Stream Protection In Logging Operations

Tree and Fish. So closely connected, Fish might as well live on the limbs like leaves. **Guidelines** *is a clear and honest, beautifully illustrated pamphlet balancing wood products with fish life.* **Logging Roads** *is less focused on fish than erosion (which is stream which is fish). Careful, semi-technical and technical recommendations on road construction. (In many timber lands, 80% of the erosion is from road-building, not the cut forest.) –PW*

Guidelines for Stream Protection In Logging Operations
Richard Lantz
1971; 30 pp.
Free
from:
Oregon Dept. of Fish & Wildlife
P.O. Box 3503
Portland, OR 97208

Logging Roads and the Protection of Water Quality
(PB 243-703)
1975; 312 pp.
$9.75 postpaid
from:
National Technical Info. Service
Springfield, VA 22161

Industries based on timber and fish resources have flourished in the Pacific Northwest since pioneer days. The question is: Can forest lands be managed to provide necessary wood products as well as fish for commercial fishermen and an increasing number of sport fishermen? *–Guidelines*

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Drainage design often appears to have lacked attention to one or more of the following features.

1. Determination of the design flood.
2. Evaluation of the potential for debris blockage.
3. Choice of stream crossing method.
4. Attention to installation requirements at both the design and construction levels to insure structural integrity.

Minimizing surface erosion and sediment transport begins with the appropriate treatment or design of slope protection, and continues with the necessary attention to ditch size, lining, culvert intakes, culvert integrity and culvert outlets.

–Logging Roads

•

Living tree roots help maintain slope stability. Reports by the Forest Service from southeast Alaska indicate that the number of landslides from cut-over areas increases within 3 to 5 years after logging. This increase is attributed to a reduction in soil shear strength caused by the decay of tree roots following logging. The presence of living tree roots to anchor shallow soils to the underlying subsoil appears to be particularly important in small drainages where winter storms can cause the groundwater level to rise sharply.

–Logging Roads

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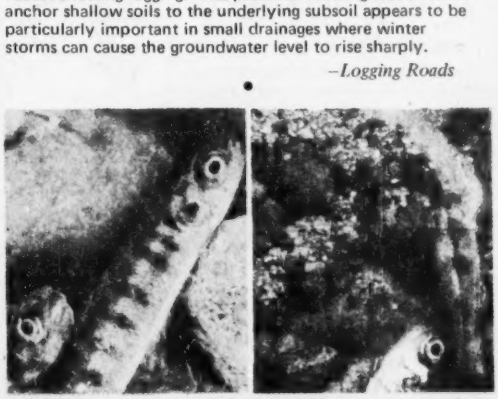


On the left is clean gravel without fine sediment: eggs and fry can breathe, eat, survive. On the right sediment in gravel have trapped young coho salmon. They could not move into the stream to feed (from **Guidelines**).

Diagnosing Stream Health

by THOMAS DUNNE and LUNA B. LEOPOLD

. . . The present discussion is directed to the planner and environmentalist who, with little or no previous training, desires to learn a technique for making a basically sound, though admittedly rudimentary, evaluation of stream biota based on field observation alone without the help of laboratory or microscope.

This is the first key of its kind. Lets you walk down to a creek or stream and get a feel for its health. It's part of another chapter in **Water in Environmental Planning** *to be published in the fall of '77. –PW*

A healthy stream has a large variety of organisms and a moderate population of most. Diversity is thus a key attribute. High diversity is indicated by many forms or species, but not a predominance of any one form. As diversity decreases, one of the indications of loss of health, there are fewer taxa and one or several will have a large population at the expense of other forms. When the population as a whole becomes small and only a few forms are present, either heavy organic pollution or toxic poisoning is indicated.

The second principal expression of health, or lack of it, is the mix of particular genera. As health deteriorates, some forms will become rare or absent and others more common. Therefore, the evaluation is based on the combination of families or genera present and the relative abundance of these.

. . . Patrick and Grant (1971) recommend that half an hour be spent working in a stream 75 feet wide or less, but an hour is needed to examine a stream 75 to 150 feet wide. The time is used examining rocks picked up from the bed, looking at invertebrates on these rocks, examining floating or submerged debris such as deadwood, and sweeping deep water at stream

Bacteria

An *Actinomycete*, named *Sphaerotilus,* is an indicator of severe pollution, especially by large amounts of carbohydrates. It occurs, therefore, in streams receiving waste waters from such industrial processes as pulp and paper manufacturing.

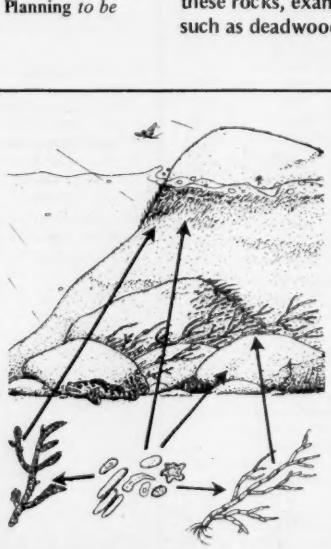
It appears as a gray, gray-brown, or brown mass of waving hairs trailing down from fixed objects in the stream. The mass may be a foot or more in length and has the appearance of moldy growth often seen on rotting food.

Diatoms – Algae Slime

These microscopic members of the plant kingdom display beautiful designs under the microscope, their silicious or organic structure taking on a great variety of rod-like, ovoid, or streamline shapes; they proceed quickly across its field of view. But because the field observer cannot see these forms, the macroscopic character must be observed.

One common form of diatom bloom is a brownish slime covering a rock. It often has the color of ice tea. Under water the slime coating may appear to have a palpable thickness, like a piece of velvet with each hair thin and waving.

Another common form looks initially like an oil slick, brownish or yellow-brown in color, and irridescent with blue or violet hues. It is often seen in still water or unmoving backwater.



Riffle or fast water nutrients: (1) water moss Fontinalis; (2) diatoms; (3) algae Cladophora.

Algae may be green or brown, the former taking on its color from the chlorophyll it contains. Most diatoms appear more brown than green when viewed microscopically, but may still give water a bright green or yellow-green opaqueness as in lake water experiencing a bloom.

Filamentous or Matted Algae

Light green or yellow-green, waving, thin filaments several inches to more than a foot long trailing downstream from banks or debris would probably be *Spirogyra,* an unbranched filamentous green algae. Macroscopically the branched *Cladophora, Odegonium,* and *Stigeoclonium* may appear similar. Some of these may hang as thick fringe from a wall or a stick in fast flowing water. Each will be a light green color and feel slimy.

Blue-green algae are mostly matted, appear as a clump or mass of velvety soft unwaving material, as if a piece of sod covered with moss had been submerged. But the color is diagnostic. Blue-green algae are hunter green or dark green, in contrast with the light or yellow tint of the green algae.

The blue-green *Nostoc* produces colonies that resemble jelly-balls about the size of a marble, each ball having a gelatinous coating. Another mat-forming blue-green algae is *Phormidium* that produces a tough, compact, brownish, gelatinous mass fixed to the substrate.

Of taxa ordinarily occuring in lakes, but sometimes found in still water of a stream, two may be mentioned. A dense gelatine mass floating at the surface in still water having a moldy appearance may be the blue-green *Anabaena*. Greenish strings resembling lawn clippings floating in water may be colonies of *Aphanizomenon.*

margins with a net or porous sweep. During the time of examination, biotic forms may be observed with a hand lens on the rock or may be taken off by tweezers and examined. On a rock of fist size one may find 3 to 15 crawling insects and a few to dozens of larval cases. Such numbers would signify very common or common, but when one or two forms per rock are found, they would be considered less common. If few insects are found when several rocks are examined, they would be considered rare.

In the course of working in both pool and riffle, if any fish are present some will be seen even if they evade the net. If none are seen at all, they might be considered rare.

BIBLIOGRAPHY

A New Field Book of Freshwater Life, Elsie B. Klots, 1966; $5.95 postpaid from G.P. Putnam's Sons, 200 Madison Ave., New York, NY 10016. A semi-technical book on biology and identification of freshwater creatures.

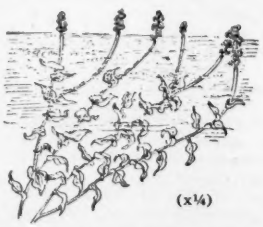
The Life of Rivers and Streams, Robert L. Usinger, 1967; $5.50 postpaid from McGraw-Hill Book Co., Princeton Rd., Hightstown, NJ 08520. A semi-technical book on biology, identification, and surveying freshwater life.

The Biology of Polluted Waters, H.B. Hynes, 1970; $10.00 postpaid, and **Ecology of Running Waters**, 1970; $27.50 postpaid, both from Univ. of Toronto Press, 33 East Tupper St., Buffalo, NY 14203. Two of the best technical books on all aspects of running waters.

Rooted Aquatics or Aquatic Weeds

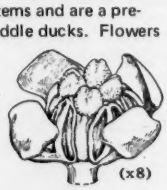
The submersed aquatics may be used as one indicator of stream health. They are scarce in oligotrophic waters which are low in nutrients. As the nutrient level increases, so does the population of these plants which flourish in enriched water. But the combination of factors governing the abundance of these plants is complicated so their presence is not diagnostic of nutrient level. The presence of favorable factors for their growth, slow water, silty bars on the stream bed, and optimum sunlight affect the abundance.

The three genera both common and diagnostic are Pondweed, Water Millfoil and *Elodea*.



(x¼)

Pondweed *(Potamogeton)* has a large number of species. This genus will withstand more severe organic pollution than will *Elodea* or Millfoil. Some pondweeds are locally known as Sago Weed. The leaves of the sago type are very long and narrow, often triangular in cross section, so that the difference between leaf and stem is not as marked as in most plants. Nutlike tubers occur on underground stems and are a preferred food for puddle ducks. Flowers and nuts or fruits occur at the end of a long slender terminal stem that floats on or at the water surface.

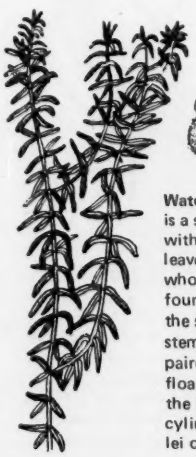


(x8)

(x1)

Water Millfoil *(Myriophyllum)* is mostly submerged but flowering spikes or a few top branches may stick out of the water. The stems are solid and thick, in simple not compound branching form. Leaves occur in whorls of three or four at nodes along the stem. In some species the whole plant has a brownish-purple color. The general appearance of Millfoil is feathery due to fine division of leaflets.

f.(x15)



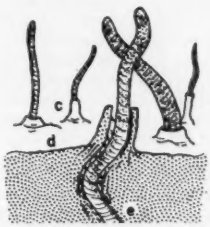
m.(x8)

f.(x4)

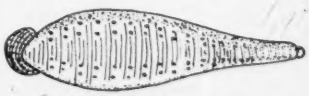
Waterweed *(Elodea)* is a submersed plant with distinct ovoid leaves occuring in whorls of three or four at nodes along the stem. The main stems branch in paired forks. The floating plant gives the impression of a cylindrical uniform lei or garland.

Worms

There are several macroscopic invertebrates that are in a general way diagnostic of stream health. The ordinary flatworms, *Dugesia* or *Planaria* are shaped like an elongated arrowhead .2-.3 in. (5-8 mm) in length, and occur in the mud or in decomposing organic debris on stream margins. When abundant, they indicate organic enrichment.



Tubificids or sewage worms closely resemble ordinary earthworms, even in the reddish color. They generally are .8-1.5 in. (20-40 mm) in length. Like flatworms, tubificids occur in mud or organic debris. The tubificids, especially *Tubifex*, are tolerant of organic pollution and if very common and other invertebrates scarce, indicate pollution.



Leeches of the order *Oligochaetes* are well known to youngsters in the old swimming hole. They are dark brown, leathery, with a fast-hold at one end which can attach to the skin and suck blood although many are invertebrate predators. When abundant, leeches indicate organic pollution.

[more ➔]

Molluscs

The molusc shells of fresh water are commonly of two types, a spiral built by a snail, and a bivalve of the clam. Both common and diagnostic is the snail, *Physa*, having a lefthand spiral shell .08-.3 in. (2-7 mm) in length. When common, *Physa* indicates organic pollution. They are however, sensitive to toxic poisoning and disappear in toxic pollution conditions.

A small clam of the size of a fingernail with a rather thick shell, less than .8" (20 mm) in size is *Sphaerium*. When common, the conditions are organically enriched. It becomes very common when the water is polluted with organic material.

A source of difficulty in irrigation canals in the western states is the fresh water clam or mussel, *Corbicula*, whose bivalve shells range from a fraction of an inch to several inches in length. These clams have a distinctive concentric sculpture of the shell. They burrow in mud or sand in the streambed. When colonies die, they can create a large dense mass of shells.

Insects

Identification of insects on the rocks of a streambed usually concerns either the larval stage or the nymphal stage. Though the free-flying insect or swimming adults such as beetles may be observed, the population can best be estimated by the immature stages — Larvae, pupae, or nymphs.

Stonefly Nymph *(Plecoptera)* is characterized by two tails in contrast with the three of the mayfly. Its six legs are usually fringed with hairs and have a double claw. The abdomen tends to be of the same order of length as the thorax, and shows no gills except near each end. The nymphs vary in length from .25-.8" (6-20 mm).

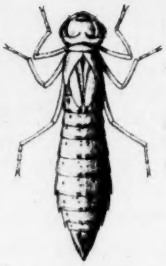
This creature is fairly sensitive to pollution and to silt in the water, and will become rare as nutrient enrichment becomes great.

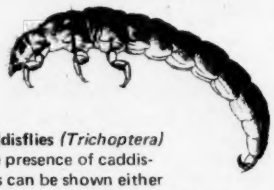
Mayfly Nymph *(Ephemeroptera)* usually has three tails but always has a single claw per leg. The tails may be feathered with hairs or may have short rough spines.

Many mayfly nymphs are fairly sensitive to pollution.

Dragonfly Nymphs *(Odonata)*

The dragonflies, *Anisoptera*, tend to have a long abdomen and usually only a short spine for a tail. They have no feathery gills. The dragonfly nymph tolerates a moderate degree of enrichment.





Caddisflies *(Trichoptera)*

The presence of caddisflies can be shown either by the larva or by the larval cases. Some caddisflies do not build cases, but spin nets or are free-living, that is, move about the substrate. The *Chimera* is an example of one that does not build a case. But even when the larva is not observed, cases may remain as evidence of the former presence of the case builder.

The cases are of several types, and may consist of small grains of sand or mineral grains cemented by an organic web, or may resemble cutin, that is built of organic material.

The caddisfly larva is tolerant of moderate to severe organic load. Mayflies and caddisflies in high population may characterize a healthy-enriched condition which stoneflies will not tolerate.

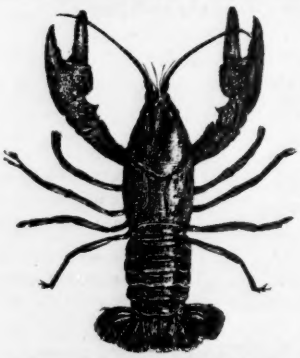
Hellgrammites *(Megaloptera)*

These forms have the usual three pair of legs as do all insects, but often have several or many paired appendages that resemble legs along their abdomen.

The hellgrammites will tolerate a heavy organic load.

Crustaceans

In the class Crustacea there are two forms, relatively easy to identify macroscopically, that have diagnostic value. *Asellus* is one of the isopods resembling somewhat a sowbug with six legs on each side and antenna as long as the longest hind legs. When this form is common it is an indicator of enriched or pollution conditions.



The crayfish, a decapod crustacean, resembles a diminutive lobster with a hinged abdomen that curls the tail under the body. Two long and two shorter antennae project forward over the claws that may be long like a lobster or short. A large population suggests organic enrichment, but there are streams such as those in the Lake Tahoe region and in Yellowstone Park where crayfish are common. As in the case of the invertebrates and molluscs, the crustaceans are found on the stream margins and in organic debris.

KEY TO BIOTIC HEALTH OF STREAM

HEALTHY: Low Nutrient

Population low but diverse – many forms, but few of any single form.

Insects common, including mayflies, stoneflies, caddisflies. Snails, crustacea present but rare; no blue-green algae.

No rooted aquatics, no yellow-green algae. Healthy, low nutrient.	Yellow-green algae rare, rooted aquatics rare or less common. Healthy, low nutrient.

HEALTHY to POLLUTED With Nutrient

Population high and diverse – many forms and high population of some forms.

Diatoms very common or common.
Insects very common or common, including mayflies, caddisflies, and stoneflies common. Blue-green algae absent or rare; fish common to less common.

Green algae rare, *Spirogyra* rare. Rooted aquatics *Oedegonium* or *Cladophora* rare or less common. Healthy, small amount of nutrients present.	*Spirogyra* common, rooted aquatics common, fingernail clams, crayfish common, *Physa* snails common or less common. Healthy, but enriched.

Diatoms less common or rare.
Insects common to less common, green algae, *Spirogyra* common, rooted aquatics common. Blue-green algae common or less common.
Nutrient enriched.

Diatoms less common or rare.
Insects less common; rooted aquatics including *Elodea, Potamagogeton* very common to common; *Spirogyra* very common to common.
Blue-green algae very common to common; mayflies rare to absent.
Physa snails, tubificids, flatworm common. *Asellus* common.

Sphaerotolis rare to absent. Organically polluted.	*Sphaerotolis* very common to common. Heavily polluted.

POLLUTED

Population low; not diverse – not many forms observed.

Blue-green algae or *Sphaerotolis* present.

Physa snails, tubificids, flatworms, *Asellus* common to less common. Heavily polluted.	*Physa* snails, tubificids, flatworms rare to absent. Toxic pollutants present.

USE OF KEY

This key provides a preliminary diagnosis. It will take a pulse, not give an electrocardiogram.

You may find two difficulties when starting. The first is that algae are hard to identify without a microscope. You might collect a bit of each kind on your first trip to the stream; identify it with a microscope, so you will recognize its "colonial" (eye size) form on the next visit. Algae abundance is also hard to judge. It varies with sunlight, tree cover, rock shadow. . . .

If you can't find algal slime or diatom blooms, move on. Look for insects and rooted aquatic plants. If there are no submerged plants and many insects of various kinds, then your diagnosis lies in the upper or healthy part of the key, not in the polluted or toxic part.

The second difficulty is seasonal change. Use your intuition to adjust for seasonal flux in population. For example, summer is a season which is ripe for flies in slow water. Autumn, on the other hand, is a season when populations may appear dense because flow is low and living creatures concentrate in small, shallow flows and pools.

Old water wisdom applies to all stream medics: Perseverance furthers. —PW

EL RANCHITO LOS PASARES

BIG SUR
MONTEREY COUNTY
CALIFORNIA

This would like to be a dude-ranch, but it isn't. In fact it's very hard to describe this place, because it does not resemble anything else. But, if you are looking for crooning cowboys, do not come here! Not a cowboy on the place, not a cow, not even a picturesque corral.

If you are looking for comfort, don't come here! You will have to sleep in a tent, or under the stars. This place is still in the wilderness, far from civilization.

The food is nothing extra. The cook is crazy. Sometimes he cooks in Chinese, sometimes in French, and again in Spanish, and sometimes in his own. He cooks when he pleases, but he never objects to your using his pots and pans, nor his kitchen. And anyway, the kitchen is also the dining room, and the dining room is also the living room, and there is nothing cozy about any of them.

In the mid-30's, Jaime de Angulo (doctor, linguist, cowboy, amazing writer, poet and anthropologist) moved to Big Sur and, in need of money, started this dude ranch. He had two guests: both German graduate students. His essays and books are listed on pg. 621, WEE. Brochure donated by Bob Callahan. -PW

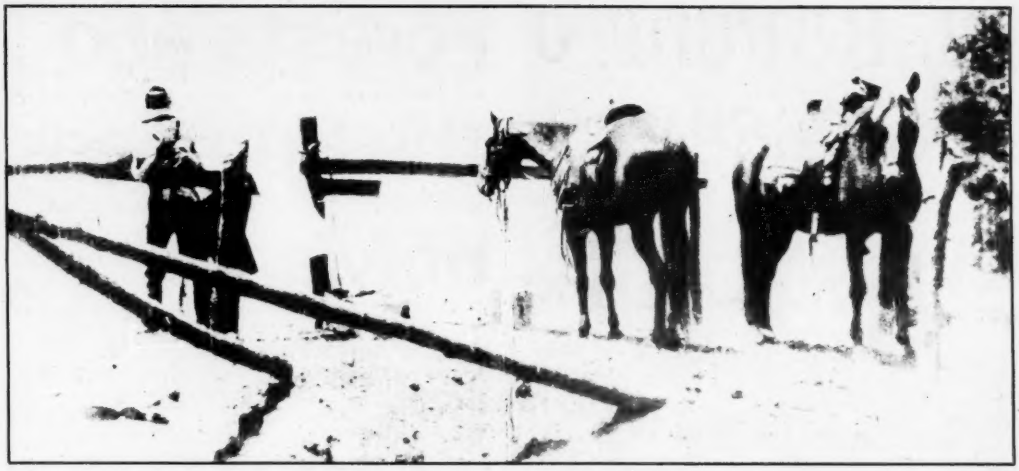
If you expect good horses, don't come here! The country is too rough for good horses. You cannot trot, much less gallop, anywhere around here. Our horses are as sure-footed as goats (otherwise they would not have survived), but even at a walk you risk your neck at every turn of the trail – and the risk is yours.

If you expect good hunting, do not come here! There are plenty of deer, but they run too fast.

If you expect good fishing, do not come here! The streams back in the hills are so full of SMALL trout that it is no sport. But to get there....! It takes a whole day's riding to get there, over an abominable trail. In fact it's not a real trail. Nobody goes there.

We will take you there anytime you like, and cheerfully. We are used to it... but you aren't. Saddle-weary and tired, you will have to sleep on the ground, in a weird canyon. You won't be able to sleep, you will get the heebie-jeebies, and you'll spend the night feeding the fire.

The caballerango-guide is as crazy as the cook, and furthermore he is bad-tempered. His language is awful. So, if you are squeamish, bring some cotton for your ears.



We have warned you candidly of all the lacks of comfort in this primitive place. But if you care to risk coming, then bring the roughest kind of clothes, a bathing suit (the beach is right under us, but 1600 feet below.) your rifle. (ours is not very good) besides deer, you will find here quail - both valley and mountain - wild pigeons, doves, squirrels, pumas, lynxes, foxes, coyotes, and coons.

Bring your own tackle (surf and stream) we're not sportsmen - we catch them in our hats.

Bring your own literature. You will find nothing here except a collection of New-Yorkers and National Geographics, several books on botany, a few silly novels, and a couple of scientific works.

As to the weather. In April and even May, it is still pretty raw, but the hills are at their greenest, and the wild flowers in bloom. In June we are liable to shiver in the fog for a whole week, and the hills are beginning to turn yellow. July and August are fairly good, sometimes hot. But from then on to Xmas it is wonderful! Lazy, soft days full of langour and longing, the ocean so still, the hills asleep in the warm sunshine. From Xmas till April it is hell, with one storm on the heels of the last.

Our rates are ten dollars a day, flat. This includes everything, food, horses, camping trips, guides, everything!! Children ought to pay double, but if they are handsome and intelligent they pay just like the others.

"And remember, dearie no recriminations"

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Eberhard Otto

A Tsimshian cedar trunk carved by Hoesem-hliyawn. Trees were checked to see if a good canoe could be made. Some trees with "canoe imperfections" like holes became totems ("images"). This hole served as a ceremonial entrance. It tells the story of a hole-in-the-ice where a fisherman caught and freed a supernatural woman. It is also the hole-to-the-sky, access for those who can travel the sky pole upward.

Forested Watersheds

It is impossible to cover humans and watersheds (soil/water togetherness) in a single (or many) issues of the **CQ**. *Range grazing, strip mining, stream and forest restoration, water supply and flood control . . . it's a bit overwhelming. So, we stuck to forested watersheds as it all started with the Tree of Life: roots in the underworld, trunk and branches inhabited by birds and shamans, and tree top, as the Algonkins say, going through the Sky-Hole (the Pleiades) into the heaven of sun-filled outer space. –PW*

Forests and the Purposes of Man

by ROY A. RAPPAPORT

Hunters/Gatherers

CONTEMPORARY hunters and gatherers at least those of the tropics, far from wresting miserable and precarious livings from unwilling environments are among the world's most leisured people. Bushmen, who live in the Kalahari Desert in South Africa need to work, which is to say hunt, and their wives need to gather, only a day or two each week to provide themselves with enough – and there is nothing material beyond "enough" to spur them to greater productive efforts. The Pygmies of the Ituri Forest probably don't have to work any harder. Both the Bushmen and the Pygmies dance a lot – in some Bushmen camps all night long as many as four nights a week.

Dancing for both Bushmen and Pygmies is both recreation and worship, as it is also for the Andaman Islanders and the Australian aborigines. Indeed, the Pygmies don't make a clear distinction between recreation and worship. That is, worship, which involves most importantly dancing, singing and the playing of flutes is undertaken, Pygmies say, to entertain the God *Ndura*. Now *Ndura* is not exactly a god *of* the forest. *Ndura* is both god *and* forest, or, if you prefer, forest *as* god, but a god that is co-extensive with the natural world. The forest, which is to say the world, is thus *personified* and *sanctified*, and the object of religious ritual is to make *Ndura* – the forest – happy. If *Ndura* is happy no ill will befall *Ndura*'s children, men. One keeps *Ndura* happy by entertainment and by respect for *Ndura*'s person, which includes animals, plants, and even streams and rocks. *Ndura* is thought to become immanent, if "immanent" is an appropriate term, in a fire, called "the Heart of *Ndura*" ignited at the commencement of religious rituals. There are strong suggestions that the fire is a male symbol, but beyond that it seems to represent life or at least some sort of vital force, consuming on the one hand and invigorating on the other, a principle or agency that recovers life from death, or, if you prefer, transforms that which has died into new living shapes.

UMI

In **Pigs for the Ancestors** *(EPILOG, p. 454), Roy Rappaport was the first professor to come right out and say: ecologically appropriate action and religious acts, these are the same phrases. This article is a brave attempt to define HARMONY while sitting among the sno-mobiles, motels, haul roads, and multinational logging operations now eating America. Here, Rappaport becomes the first professor to understand how human mood (dance, music) is intimately connected to human attitudes toward their watershed. He says, among other things: recreation (re-creation really) and worship, these are the same words.*

This article is drastically edited from a talk Rappaport gave at the Forestry Service Symposium ("Fire in the Environment") in Denver, 1972. –PW

We cannot, of course, make judgments concerning the theological soundness of Pygmy religious conceptions any more than we can concerning those of Christianity or Judaism. But it may be observed that they explicitly establish with the ecosystem what Martin Buber, a modern Jewish theologian, calls an "I-thou" relationship (a relationship in which the alter is treated as an equivalent of ego, in contrast to an "I-it" relationship, in which the alter is treated as a mere object to be exploited). The Pygmy religious conception is also reminiscent of the theology of the Protestant Paul Tillich who took what he called "The Ground of One's Being" to be continuous with "The Ground of All Being." Although Buber loved Yahweh and Tillich Christ, they would have agreed that the Pygmy love of *Ndura* is highly moral. I think we could agree that the conception of the forest as a deified *person* serves to direct men's purposefulness toward goals coinciding with the needs of the larger natural system of which men are parts. Whatever its theological virtues it would seem that animism, the attribution of divine character to natural objects or natural systems, is ecologically sound.

Forest Horticulture

IT MAY HAVE BEEN with his elevation to the role of ecological dominant, a role assumed with the emergence of plant and animal cultivation perhaps 10,000 years ago, that man's purposefulness began to become seriously disruptive. Man himself is a poor dominant. It is significant that in non-anthropocentric systems of any size the dominants are almost always plants – the "A" stratum trees in the rainforest, the algae in the reef, the grasses of the savannah. Plants, because they are without conscious purpose, are well-suited to be dominants: their *mere existence* fills the role, and the conditions which they set for other species tend to be stable. Men, on the other hand, must *act and act continuously* to maintain their dominance, and the action of men is less to be relied upon than the stolid existence of oak trees or algae. Men, unlike oak trees and algae, are also capable of making mistakes, and since the self-interested purposes of men may not coincide with the requirements of the systems they dominate, the conditions set by men tend toward instability.

I have worked with a group of forest cultivators, a people called the Maring. The Maring occupy the central Simbai and Jimi valleys in the Bismarck Range in Australian New Guinea. Completely autonomous local groups ranging in size from around 150 to about 900 people occupy territories several square miles in area, most of which rise from the river of one to two thousand feet to the ridge top of seven thousand to seven thousand five hundred feet. The region was probably covered by climax (or at least very mature) forest until fairly recently. Now the zones below five thousand five hundred feet are largely under secondary forest and gardens with small remnants of climax forest remaining on ridge tops. Somewhat larger stands of mature forest persist at the lowest altitudes, *where there are also extensive groves of cultivated* pandanus. In the Simbai Valley most horticulture takes place between three and five thousand feet. Gardens are found at somewhat higher altitudes in the Jimi Valley.

Maring horticulture is of the sort called "swidden-ing" or "bush-fallowing" or "slash and burn." Each year a gardening pair – usually a man and wife – will clear cut one or more gardens in the secondary forest. These are seldom more than an acre in extent. After clearing the underbrush and felling and pollarding the trees and making fences from some of the logs, the slash is burned. Burning not only disposes of the litter but also liberates the nutrients in the cut vegetation making them available to the crop about to be planted. *Since the stratum of fertile soil under the* Maring forests is seldom more than two inches in depth and easily depleted the nutrients freed by burning are highly beneficial, if not crucial, to the growth of garden plants.

[more →]

Roy A. Rappaport

In the foreground is the woman's house of the Tsembaga, a Maring-speaking tribe of New Guinea. Between woman's house and the hills is the dance ground. On the hills of Simbai Valley, the "clear cut" gardens can be seen as light patches in the forest.

Unesco-Collection, An Anthology of African Music, No. 3

Ba-Benzele Pygmy playing the hindewhu *(whistle made from the twig of a papaw-tree).*

When the burning is completed a great variety of cultigens – banana, taros, sweet potatoes, yams, *Rungia*, sugar cane, hibiscus, beans, *Saccharum edule, Setaria* and many others, are interplanted in the same garden in what appears to be, but is not, helterskelter fashion. The Maring gardener is expert at taking advantage of micro-environmental variations and there is a reason for each plant to be where it is.

Weeding is selective. Herbaceous species are removed, but arboreal species are allowed to remain from the day of planting on. After fourteen or fifteen to twenty-eight months, depending on the altitude and other factors, the regenerating trees have made harvesting so difficult that the gardeners abandon whatever crops remain to their pigs, whom they confine in their gardens for a week or more. The pigs, in their quest for tubers, soften and aerate the soil and thin the regenerating seedlings. Secondary forest then takes over completely and the site remains under forest fallow until a canopy has formed on the trees twelve inches or more in diameter and until the ground becomes soft again. This takes eight to forty or so years, depending upon the altitude.

The Maring maintain high population densities with this sort of horticulture – in some localities, in fact, densities exceed 200 persons per square mile of arable area. Slash and burn, as practiced by the Tsembaga Maring whom I know best, does not seem to do serious damage to the ability of the climax to return to sites from which it has been removed. While regrowth on abandoned gardens is pioneered by fast-growing sun-loving second growth forms such as *Alphitonia iacana* and *Dodonea viscosa,* as it develops more and more species characteristic of climax, or at least mature forest, appear. Of thirty-six species present on one site sampled four years after abandonment eighteen were part of climax associations found at that altitude. On another site cultivated twenty to twenty-five years earlier eighteen out of twenty-six species were climax forms, with such families as *Fagacea, Lauraceae* and *Moracea* well-represented.

We may reflect here on the general strategy of slash and burn forest horticulture. It is to establish temporary associations of plants directly useful to man on sites from which forest is removed and to encourage the return of forests to those sites after the useful plants have been harvested. The return of forest makes it possible, or at least much easier, to establish again an association of cultivated plants sometime in the future. The Maring recognize this, of course, and are almost as solicitous of the trees growing in their gardens as they are of cultivated plants. Their appreciation of the regenerating forest is clearly reflected in their term for it: *nduk mi,* which means "mother of garden."

It is clear that the Maring nurture not only the garden species that provide them with food directly, but also those species upon which they indirectly, but nevertheless ultimately, depend: the forest species that make it possible for the garden species to flourish from time to time.

Effective ecological regulation, which is to say the maintenance of the circular structure of ecosystems, depends in systems dominated by men on effective information feedback from the environment to those operating upon it (the flow of information through ecosystems, like the flow of materials through the same systems, must be circular). Information feedback from the environment is sensitive and rapid in small autonomous ecological systems in which everyone is a gardener. There are no special interest groups in the societies participating in such autonomous local systems. It is clear to *all* men living in such systems that their survival is contingent upon the *maintenance*, rather than the mere *exploitation* of the larger community of which they *know* themselves to be only parts. They comprehend more clearly than hunters and gatherers and more clearly than modern men the circular structure of their world and they are likely to understand well that their own purposes or goals are limited by that circular structure and the need to maintain it. It is worth noting here that the Maring and other New Guineans conceive the world as a set of cyclical processes. Not only are gardens and forests in their view merely different phases in the same cycles, so are growth and decay, for young plants grow out of the decomposition of older ones. The Maring call those spirits concerned with the fertility of gardens, of pigs and of people *Rauwa tukump*, which means "Spirits of Rot," and the "Spirits of Rot" are responsible not only for fertility, but also for death.

Twentieth Century

THE ECOLOGICAL circularities that are apparent to the Maring horticulturist are masked from men in state-organized societies by the sheer scale and complexity of these societies. Ecological considerations are less and less likely to temper purposefulness simply because ecological awareness is diminished. Ecological "rationality" – a rationality that is concerned to maintain the circular structure of ecological systems, a rationality that may not be ashamed to invoke mystical conceptions and feelings – is replaced by economic rationality.

To the members of a small, autonomous primitive group living within the forest, the forest seems to be all-encompassing, even to be co-extensive with god and the world. But to the members of a huge and differentiated state-organized society a forest is merely one vegetal association among many, one limited to one or a few regions among the many encompassed by the society. This is to say that the forest is no longer conceived to be a *generalized, autonomous personified ecological system*, but to be, simply, one element or *sub-system* in a larger *socio-economic system*. It is no longer mother and father to us all as it is to the Pygmy, not an indispensable link in the circle of growth and death as it is to the Maring. It is now a "resource." It has been degraded from the status of the world itself to mere object, an "it," something to be used.

Of particular interest here is the presence of all purpose money, which is absent from primitive societies. This is to say that it tends to dissolve the differences between all things by imposing one simple metric – that of dollars or whatever – upon the marvelous variety of things of which the world is made. Now living systems – plants, animals, ecosystems – are themselves very diverse, and each also requires a great diversity of distinct materials to remain healthy. But with money it becomes possible to make decisions affecting this diversity and complexity on the basis of a very simple arithmetic. All of the great range of unique and distinct materials and processes that together sustain or even constitute life are forced into an arbitrary and specious equivalence by reducing their values to monetary terms. What is the difference between a forest and a sub-division? The correct answer becomes one of the class: $20,000 per acre.

The Problem of Harmony

THE PROBLEM OF HOW WE may live in harmony with our forests is the problem of controlling men's narrow and linear purposes so that they will not destroy the circular ecosystems to which contemporary humans remain as indissolubly bound as were their ancestors of a million years ago. If we are to live in harmony with our forests and other ecosystems we must restore and maintain their circular ecological structure. Such restoration and maintenance in turn requires the restoration of circular structure in our social and political systems so that the feedback of information concerning the states of social and ecological variables from the public and from the environment to regulatory agencies is assured. The problem of how to live harmoniously with our forests is not a problem in forestry. It is, rather, a set of social, economic, political, conceptual and even ideological problems. Their solutions are not to be sought through simple changes in forestry practices. They are to be found in changes in the organization of our thought and of our society. ■

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DOUGLAS FIR *CLEARCUT*

The Fine Grain

In the summer issue, Stewart Brand played provocateur. He said, "As an old logger, it's my understanding that Douglas fir (at least) doesn't grow back so well unless it's clear cut . . ." Below are a few of the letters answering (and pretty much contradicting) Stewart. —PW

GERALD MYERS

Project coordinator of Beginnings, Inc., (the Redwood Creek Watershed Restoration Project).

I come from three generations of Douglas fir gyppos, and have been asking the same question for a long time. Recently I have really started to dig, 'cause the Renewal Project gets into the whole land management, productive capacity area.*

What we are up against in our labor intensive Ecological Forestry proposals is the whole attitude and "management" approach of agri-business: Schumacher's "industry applied to agriculture." The attempt is to maximize one system variable – wood fiber production. Simplification of the environment, use of energy-intensive machinery and fertilizers and herbicides (2,4,-D and 2,4,5-T), and soil loss are acceptable and inevitable costs of production – which outweigh the benefit to society of true multiple-use, diverse, uneven-aged stands of forests selectively cut. It's partially a matter of what costs are figured, where they are placed, and how they are figured. It's mostly a matter of choice – *possible* lowered fiber production versus diversity and eco-system health.

I don't know "The Answer" – but it seems advisable to maximize our options by backing both Industrial and Ecological Forestry. Industrial forestry has immense backing right now. Ecological forestry ain't got none. I'm betting that ecological forestry has greater economic long-run potential than industrial – also more survival value and higher quality of life for those people in it. Now I'm scratching for backing – probably governmental.

***Gerald mentioned two articles, both of import. The "ecological forestry" argument is clearly stated by Peter Twight in Ecological Forestry for the Douglas Fir Region, March '73, (available from National Parks and Conservation Association, Washington, D.C.). The "industrial forestry" attitude is found in USDA Forest Service EIS, June 1974, for "Forest Reestablishment on National Forests in California."**

RANDAL O'TOOLE

Staff Forester, Cascade Holistic Economic Consultants

Douglas fir is the most important tree in southwest Oregon. Working under the delusion that Douglas fir "needs" clearcutting in order to reforest itself, the Forest Service and BLM land managers persistently clearcut for year after year. Private landowners clearcut in southwest Oregon because it was profitable, and because most have since sold their land or gone out of business. There is no record of whether they believed they were clearcutting the forest to save it.

Whatever they believed, today over a million acres of forest land is denuded in southwest Oregon, and most of it will require decades to recover. Because of the hot and dry climate, unshaded soils become so hot in late summer that they literally burn up any seedling which tries to establish itself.

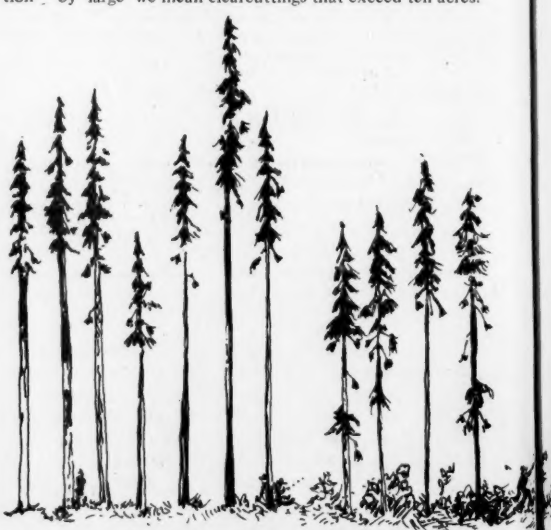
Clearcutting is controversial because it is unsightly. However, the timber industry annually produces reams of literature claiming that clearcutting is necessary because seedlings of Douglas fir and certain other species will not grow without plenty of light.

In reality, it was proved long ago by Forest Service studies that Douglas fir seedlings grow best in about 35% shade for the first ten years of their lives. Only after that will they become stunted without full sunlight.

Selection cutting, a method often proposed by environmentalists, removes a few trees each year but always leaves the forest in an uneven-aged mix of seedlings, saplings and near mature trees. The shade provided by the older trees would be detrimental to ten-year old and older Douglas fir saplings. If selection cutting were the only alternative, clearcutting would be the best method to harvest Douglas fir in most cases.

But there is another alternative, called shelterwood cutting. In this system, the entire forest stand is removed in two or three stages. At the penultimate stage, the remaining older trees provide about 35% shade, allowing for Douglas fir regeneration and growth. When the seedlings are between five and ten years old, the last stage of tree harvest takes place.

Forest service ecologist Jerry Franklin and Crown Zellerbach researcher Dean DeBell summarize recent research when they point out that "Biologically, no types or species appear to *require large clearcuttings* for successful regeneration – by 'large' we mean clearcuttings that exceed ten acres."



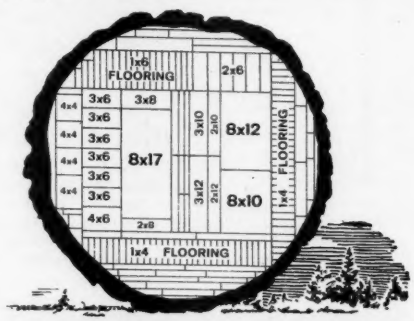
Clearcut Succession To Old Growth | **Old-growth Timber Minimum Undergrowth 60 - 300 Years** | **Second-growth Timber Scattered Brush 30 - 60 Years**

Franklin and DeBell add that "The prime reasons for large-scale clearcutting . . . are those related to efficiency and economics and harvesting and managing the stands." In short, clearcutting is promoted by the timber industry not because it is ecologically sound, but because it is more profitable.*

In the low elevation forests of western Oregon, clearcutting sometimes works – that is, trees sometimes grow back of their own free will. More often, hand planting of several hundred seedlings per acre is necessary. If a fourth of those seedlings die, it is considered normal – if many more die, the clearcut is likely to be invaded by brush. Bring on the herbicides.

In the interior valleys of southwest Oregon, as well as the upper elevations of the entire Cascade Mountain Range, clearcutting has been a dismal failure. Numerous instances of three and four plantation failures on a single site, with or without the aid of herbicides, have been documented. Thin soils which get very hot in late summer are the major problem.

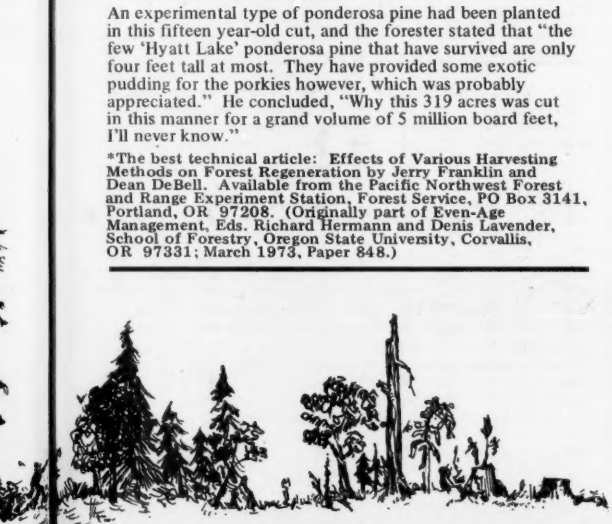
On one clearcut a BLM forester recently attempted to measure stocking of seedlings. "I conceded it as useless since the soil was composed of 99% rock and 1% stump. . . the canyon live oak and the poison oak are still doing quite well however," he wrote.



Crosscut of fir. Heavy structural timbers are from center of tree. Thinner boards and flooring are from edges.

An experimental type of ponderosa pine had been planted in this fifteen year-old cut, and the forester stated that "the few 'Hyatt Lake' ponderosa pine that have survived are only four feet tall at most. They have provided some exotic pudding for the porkies however, which was probably appreciated." He concluded, "Why this 319 acres was cut in this manner for a grand volume of 5 million board feet, I'll never know."

*The best technical article: Effects of Various Harvesting Methods on Forest Regeneration by Jerry Franklin and Dean DeBell. Available from the Pacific Northwest Forest and Range Experiment Station, Forest Service, PO Box 3141, Portland, OR 97208. (Originally part of Even-Age Management, Eds. Richard Hermann and Denis Lavender, School of Forestry, Oregon State University, Corvallis, OR 97331; March 1973, Paper 848.)



Immature Conifer
Heavy Brush & Hardwoods
8 - 35 Years

Seedling Conifer
Annuals & Small Brush
4 - 12 Years

New Clearcut
Grasses & Annuals
0 - 6 Years

NANCY GRAYBEAL

Forester, Hoodsport Ranger District, Olympic National Forest, Hoodsport, Washington

No, S.B., it is not necessary to clearcut Douglas fir to achieve regeneration. True, Douglas fir is classified as an intolerant species (a pioneer plant often defined as needing full sunlight for survival), but numerous studies have demonstrated that Douglas firs will regenerate themselves under the partial sunlight of a shelterwood. Shelterwood harvest systems (i.e., a type of regeneration system where trees are logged in several stages instead of all at once) are standard practice in the Douglas fir region. In fact, without the protection afforded by a shelterwood, it would be impossible to obtain quick regeneration of Douglas fir on the tougher sites. So hopefully we've laid the myth of the necessity of clearcutting Douglas fir to rest.

But before everyone jumps into the "Ah-ha, I told you so" syndrome, let me controversially suggest that just because clearcutting is not a *necessity*, does not mean it is not *appropriate*.

As a silviculturist, I go through a specific thought process when deciding on a harvest system. Several variables are always evaluated. I first consider the physical and biological variables of the site. These include the age of the trees; the species composition; the rate of growth and the productive capability of the site; the percent of slope; the soil type and depth; the stability of the soil; and the wildlife species present to name a few. All these influence the ease or the difficulty of obtaining prompt regeneration. If I conclude that regeneration will be no problem if clearcut, I think of the various social factors involved. If it's a high use recreation area where maintaining the natural beauty is the highest priority, then forget the clearcut.

A common complaint expressed about clearcutting is that it is the cheapest system available. Well, that's usually true. But does that automatically make it bad? The money the Forest Service receives to do its various jobs is money appropriated by Congress. It's YOUR money. Visually, I may dislike clearcuts – agreed, they can look like a real disaster area for several years. But professionally, a personal dislike for the appearance of a clearcut holds no water. I have an obligation to wisely spend your money in a way that will obtain quick regeneration, offer maximum resource protection and all at the least cost. A decision to clearcut can be biologically, socially, and economically completely appropriate.

JOHN OSNES

Conservationist and pulp mill worker, Sitka, Alaska

You put out a question concerning the controversy of clearcutting so I thought that perhaps the article included with this letter would help clear up some of the mud surrounding the issue.* In essence, the particular logging practice that would do the least damage to an area is highly dependent on the ecosystem of that area. In a well watered region such as the western coast of Washington, clearcutting of Douglas fir is feasible providing there are enough cover trees in the area for the Douglas fir seedlings to grow. In a warmer climate, more of these shade and seed providing trees are needed.

It seems that this creature Douglas fir doesn't cater to Alaska's wet and sloppy climate. The dominant trees in this area are Sitka Spruce and Hemlock. The Forest Service and the State of Alaska decided a number of years ago that economic growth was needed in the southeastern part of Alaska. What was there to exploit? What else but the mighty Spruce and Hemlock (mining interests are coming in now). Promptly, contracts were drawn up and the largest section of land under the jurisdiction of the Forest Service was divvied up into three fifty-year contracts. Hmm, a wood nymph, just the other day, whispered in my ear that it takes a tree in this neck of the woods about a hundred years to reach adolescence.

Clearcutting versus selective cutting is a closed question up here. The layer of topsoil is thin to the extent that the tree roots remain fairly close to the surface. Selectively picking out the mature trees opens the rest up to severe windblow which is a major problem in this part of Alaska. If the Monengahela decision were to be enacted upon the whole of

"WEED TREE"

Alder Needed By Great Doug Fir

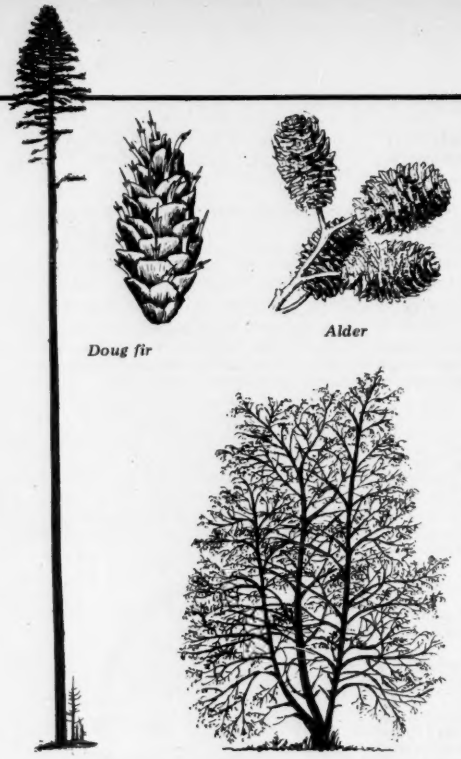
The Red Alder of the Pacific Northwest has a bad rep: "weed tree," low market value, fast invader of potential fir plots. But, uncover the reputation, and a wonderful, helpful tree is found. Alders, like beans, can fix nitrogen from the air. They can take atmosphere and turn it into the building blocks for protein. Alders produce four times the nitrogen of other North American trees. And, being generous, the Alder is deciduous. It puts the nitrogen in little capsules (called leaves) and then drops them on the ground to return to the forest floor or enter nearby streams.

In streams, these time-released nitrogen capsules eventually supply over 50% of the energy needed by young coho salmon in Oregon. On the forest floor, the decomposed leaves strengthen young and old Doug fir. (Nitrogen is especially important to Doug firs – that's why Weyerhauser needs to fertilize – and is often lacking in Pacific Northwest soils.)

Doug fir's need for strength is crucial when *Poria weirii*, a root rot fungus gets in. This soil fungus is the Northwest's most serious forest disease, the Alder, however, is immune to *Poria*. But, Alders are not selfish. Besides saving themselves, they spread their fungicide in the soil helping the ailing Doug fir. As said, the increased nitrogen provided by Alder leaves encourages other microbes that fight root rot.

As if this wasn't enough, Alders eradicate themselves in time to allow mature Doug fir to grow. From age 0 to 20, Alders grow faster than firs. From 20 to 40, Doug fir grows as fast, if not faster. During this period, a lot of pushing and shoving occurs. But, after 40, Doug fir becomes dominant and, by the end of sixty years, the Alders have returned their bodies to Earth. During the short spurt of competition, Alders encourage Doug fir to attain a more beautiful (smoother-boled, smaller limbed) shape.

Finally, Alders help humans keep soil for the whole forest (Doug firs included). After clear-cutting, large masses of soil can become soaked with water and begin to creep and move downslope into the streams. Alders get there fast by wind-seed dispersal and draw up the water that causes this hillslope wasting. Along streams



Alders are even more important: reducing the ground water influx from nearby stream banks (partial area contributions) which strengthens stream banks against rushing waters.

So, love the Alder, the "weed tree." It is a friend that doesn't deserve to be bull-dozed, brush controlled, herbicided and burned. It is an invader preventing Doug fir monoculture by helping the Doug fir. —PW

See Malcolm Margolin's article: "Hurray for the Alder" in The Living Wilderness, Spring, 1974.

the Tongass National Forest there would be no way to economically harvest this delicate ecosystem. For this reason the logging industry, state legislators, and other progress oriented people are trying their damndest to enact legislation to maintain "business as usual."

It has been said up here that "the only good tree is a stump." It's too bad that our noble tree has lost the ability, or perhaps the desire, to communicate with us.

P.S. If you can believe it, I work at a pulp mill and am also a board member of a conservation group. Har! Har! Both groups have their own set of "reliable facts" which oftentimes contradict each other, but both groups maintain policy to eaploit the poor tree on a macroscopic level. Ecotopia . . . HELP!

**Article was: "The Murky Annals of Clearcutting" by Ivan Doig, Pacific Search, Dec.-Jan, 1975-76. (A must for those interested in clearcutting. —PW*

MALCOLM MARGOLIN

Director of conservation projects in Oakland, California; fruitpicker; tree planter; gardener; cook; truck driver . . . .

If one thinks in terms of producing the maximum amounts of cellulose fiber per acre per year – and producing it in a form best suited for the manufacture of plywood – and if one is willing to "mine" the soil without regard for long term consequences – then clearcutting in 40 or so acre sections and replanting with pure stands of Douglas fir is a desirable practice. Douglas fir does grow in light shade, but it grows faster, straighter, and taller in pure stands planted in full sun. At least, it will grow better for one, two, or three generations.

However, the repetitive planting and harvesting of "crops" of Douglas firs has severe long-term consequences that no one is paying much attention to. There is, for example, a steady depletion of nitrogen in the soil which Weyerhauser and others are trying to make up with chemical fertilizers. There's also, of course, the mechanical disruption of soil due to a full-scale logging operation and subsequent erosion, which is resulting in a loss of topsoil throughout the forest areas. This will eventually reach crisis proportions, although the brunt of the crisis is so far off no one is particularly concerned.

Of equally great significance, at least in my mind, is the loss of variety that is taking place because of "tree farming" with pure stands of Douglas firs. While Doug firs are, indeed, the dominant species of the Pacific Northwest, pure stands are not anywhere near as common as many people suppose. They are often mixed with Sitka Spruce, hemlock, true firs, cedars, and a variety of hardwoods – all of which are vital to a healthy forest and a full wildlife population. Pure and extensive stands of mature Douglas firs are a fairly barren wildlife habitat. The planting of extensive stands of Douglas fir, often from a narrow genetic base selected for fast growth, leads to all of the classic problems associated with any other monoculture.

Access to Forestry

Forestry As If Trees Mattered: A Bold Stand; Gordon Robinson; $ .75 postpaid from Friends of the Earth, Forestry Issue, 529 Commercial St., San Francisco, CA 94111.

Questions and Answers About Clearcutting: Two Points of View (4 pp., September 1975) and **Timber Resource Planning of the National Forests** (2 pp., September 1975). Both free from Sierra Club Information Services, 530 Bush St., San Francisco, CA 94108.

Better than anyone I know, Gordon Robinson can remind us that forestry was once an art. There is excellent forestry. He writes from 27 years as chief forester for Southern Pacific's 700,000 acres of Northern California forests. Excellence has no illusions. —PW

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Log and Log Exports; $ .30 postpaid from Pacific Northwest Research Center, University Station, Box 3708, Eugene, OR 97403.

A 6-page pamphlet. Effects of shipping unprocessed logs overseas, the growth of the Southern plywood industry and the timber industry's multinational expansion. Score: Global conglomerates, $Billions; Lumpen proletariat, a few bucks. —PW

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GORDON ROBINSON

Formerly chief forester for Southern Pacific's Northern Northern California forests. Now, consulting forester to environmental groups.

Clear cutting results in increased fire hazard, because fire hazard is a function of fuel moisture content. In a forest the inflammable material on the ground is relatively moist and slow to burn because of shade from the tall trees and moisture of transpiration held under the forest canopy where air is less free to move than where there is no forest. When all the trees are removed over an extensive area, inflammable material will be hotter and drier than under a forest and, therefore, will more readily burn.

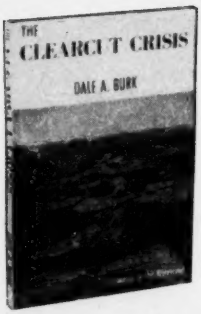
Clear cutting impairs the productivity of the land, because it causes accelerated erosion and loss of all important topsoil. Erosion increases exponentially with increase in the size of cut. Clear cutting impairs the productivity of the land. It causes accelerated leaching of nutrients essential to tree growth.

Clear cutting impairs and reduces the amount of the habitat essential to wildlife. Some species require relatively mature trees for nesting and for food. Some species require dead trees or hollow trees for nesting. The commercial species of wildlife, principally deer, require a combination of tall trees for shelter and small openings for food. Research indicates that deer thrive best in selectively managed forests. Clear cutting results in closed even-age stands a few years after regeneration, which provides no food or shelter for most desirable species of wildlife.

Clear cutting impairs the productivity of the land by reducing the number of species and eliminating the wide range of benefits resulting from subtle interdependencies characteristic of natural forests. For example, dogwood and beech trees bring calcium from bedrock, convert it to organic form and deposit it on the forest floor, thus fertilizng the soil for other species. Many such relationships probably exist that are unknown.

Clear cutting and even-age management results in the hasty liquidation of high-quality timber, and therefore, leads to a future scarcity of high-quality wood.

Clear cutting impairs recreational values of the forest for many years. Clear cutting and even-age management are contrary to the principles of multiple use forestry.



The Clearcut Crisis

Dale Burk
1972; 150 pp.
$3.75 postpaid
from:
Dale Burk
Rt. 2, Box 144 B
Stevensville, MT 59870

The clearest pages of clearcut meanings about timber harvesting and its muddy results. —PW

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Processing, Procedures and Methods to Control Pollution Resulting from Silvicultural Activities (EPA 430/9-73-010); 1973; 91 pp.; $1.25 postpaid from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

A government intro to forest pollution: sediment, pesticides, fertilizers, fire retardants, thermal waters and organic enrichment. Methods of control to improve forest management. A little government double-speak about natural diseases as being just like man and the two sides to Doug Fir clear-cutting, but still the best pamphlet on the in-and-outs of pollution and production-line timbering. —PW

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Resources For the Future

1755 Massachusetts Ave. N.W.
Washington, D.C. 20036

A non-profit organization founded in 1952 with the help of the Ford Foundation. They put out some of the best academic books on conservation, economics and natural resources. These books display the luxury of supported research (thoroughness and detailed thought) and the cloudiness of the supported research (it all seems right, just impractical, flabby recommendations, no soul, etc.). Anyway, get on their free mailing list and check them out. In forestry, their best are **The Forest Ranger: A Study in Administrative Behavior** *(Herbert Kaufman, 1967, $3.45); the Marion Clawson series (***Forest Policy for the Future: Conflict, Compromise, Consensus,** *1974;* **Forests For Whom & For What?** *1975;* **The Economics of National Forest Management,** *1976) and* **The Forest Service: A Study in Public Land Management** *(Glen O. Robinson, 1975). —PW*

The Citizens' Guide to Forestry And the Environment

A funky manual on the fundamentals of timber management: includes what an environment impact statement on forest cutting should contain; great bibliography and synopses of key issues like clearcutting. If you want to start thinking trees, soils, harvesting and politics, start here.

The Cascade Holistic Economic Consultants (CHEC) provides field research, office studies and educational services. Fees are based on ability to pay. They're non-profit, tax exempt and overworked. Right now, a flood of donations could be absorbed easier than a flood of work.

CHEC also has Resource Bulletins (a non-mandatory $3/year) as well as specialty research papers that are totally relevant to Northwest forestry practices. —PW

The Citizens Guide To Forestry and The Environment
General Forestry Paper No. 1
Randal O'Toole
1976; 30 pp.

$1.00 postpaid
from:
Cascade Holistic
Economic Consultants
1604 NE 48th St.
Portland, OR 97213

HEADWATERS

A Short History of a Backwoods Battle with a Rapacious Federal Agency

by **RANDAL LEE O'TOOLE**

ART DOWNING has lived in Josephine County, Oregon for eight years. He arrived from San Francisco with a group of people known as the Friends of Perfection. Art wanted to live in the woods away from the war, government bureaucratic hassles and the inhumaneness of the big city. The Friends of Perfection's property was on Roundtop Mountain, adjacent to Federal land. No one, they thought, would bother them there except for an occasional hunter.

Randal wrote, "Personally, I am an idealist in the Ralph Nader-John Gardner sense. I believe in the American System of Government, but it can only work when individuals devote at least some of their energy towards making big government bureaucracies responsive to the people." The story he writes here is the "classic" story of city people finding the long arm of Federal irresponsibility deep in the woods. It is a story of the 1970's: Bio-Vision Confronts the Civil Service. Randal is staff forester of the Cascade Holistic Economic Council. –PW

Fat chance. One day, a notice arrived informing the Friends that the Bureau of Land Management (BLM) wanted to harvest the timber next to their property, and needed the use of their right-of-way. Since they took their water from streams flowing from the BLM land, the Friends were alarmed. Says Art, "If they had not wanted our right-of-way, we would not have known what was happening until it was too late."

Disturbed by the BLM's desire to harvest poor quality timberland as well as the BLM's seeming lack of consideration for watershed values, the Friends began a battle over the Roundtop Mountain timber sale which continues to this day. Although most of the Friends have returned to the city, Art and Paula Ajay have remained behind to gather new troops and expand their new war against BLM forestry practices in three southwest Oregon counties.

ART AND PAULA are founding members and de facto leaders of *Headwaters*, an organization devoted to protecting southwest Oregon's forested watersheds. Today, members of Headwaters all over Josephine County have filed protests, appealed timber sales, and demanded complete environmental analysis of Federal actions as is required by law.

"All of the farm and most of the residential land is in the valleys," notes Art. "The BLM has the mountain tops and the headwaters of the streams from which everyone gets their water."

Vic Poindexter, a member of *Headwaters* who has lived in the Applegate River Valley for over fifty years, recalls, "All of the private timberland around here was clearcut twenty years ago. Until then, most of the streams flowed year-round. Now even the Applegate River is at a standstill in the summer. The only year-round streams flow from Federal timberland, which hasn't been cutover."

"We think that when the timber is cut, more runoff takes place in the winter and spring, leaving nothing for the late summer," says Art. "If we get any less water from the streams where Paula and I take water now, we won't be able to live here in August or September."

Forest hydrologists disagree with Art. They insist that, if anything, he should expect more water in late summer following a timber harvest. However, Doug Swanston, a Forest Service geologist, admits that "all of our experimental watersheds are in areas of deep soils and high rainfall. We really don't know what will happen in a shallow-soiled, low rainfall area like southwest Oregon."

No matter how much or how little water will flow from the harvested watershed, the BLM admits that the water will be dirty following timber harvests. Swanston estimates that, if the Bureau completed the Roundtop sale, Art and Paula's drinking water would be "unacceptable" for domestic use for five or more years after the harvest.

I FIRST MET Art and Paula after they had inspired the Oregon Student Public Interest Research Group (OSPIRG) to study their cause. I was in forestry school at the time. OSPIRG hired me to study the practices and policies of the BLM.

While I was doing this one day, several large boxes of books were delivered to the OSPIRG office. The books were entitled **One by One** and professed to be a history of the Bureau of Land Management in western Oregon. Surprised, I asked OSPIRG's Director if I was supposed to do anything with them.

"You can read one if you want," he told me. "The author, Bob Jones, is a real fanatic. He came into my office and literally started screaming at me. The only way I could get him to leave was to agree to give these books to Oregon college students."

One by One revealed to me that Oregon has its own "Teapot Dome," a land management scandal

Left to right: Jim Jamieson, Natural Resources Defense Council Lawyer; Art Downing; and Chuck Stoddart, former BLM Director; examine a seedling – this puny thing was about all that could be found in a ten to fifteen year old clearcut.

spanning over a century involving over three million acres of forest land. It began in 1864 when Congress granted every other square mile in a forty mile swath between Portland and San Francisco to anyone who would build an "Oregon and California" railroad connecting those two cities. The grant required that the land be sold to "actual settlers" in parcels no larger than 160 acres and for no more than $2.50 an acre.

Like most such land grants, the terms were ignored by the railroad, which sold huge parcels to up-and-coming timber barons and reaped large profits from the sales. Eventually, railroad grant land became so valuable that most railroads quietly stopped selling it. But Southern Pacific, successor to the Oregon and California Railroad, made the mistake of publicly announcing that, in violation of the terms of the grant, the land was no longer for sale.

In what must have been a great surprise to the Southern Pacific, Congress became so incensed that in 1916 it took back all of the land which had not yet been sold. For sixty years, legal battles and legislative debate over what to do with the remains of "Oregon and California" land grant have continued.

At present, most of the "Oregon and California" land is under the jurisdiction of the BLM. The Bureau has a few campgrounds and picnic grounds, but the vast majority of the land is used for intensive timber production. Ostensibly by protecting fisheries and wildlife, watershed and recreation values, the BLM practices multiple use. But, as one logger

"Soil and water are not two organic systems, but one. Both are organs of a single landscape; a derangement in either affects the health of both."

–Aldo Leopold, 1941

Clearcut "blocks" surrounded by uncut Douglas fir – shows "smallpox" landscape left by this harvesting technique.

said, "Multiple use means: we get the timber and you can use what's left for whatever you want."

While the Forest Service (the other Federal Agency that controls timberland) must appeal to Congress for funding, the O & C land under BLM management has a special arrangement. The BLM can spend one-fourth of its timber sale receipts to manage the forests. Since everyone in BLM knows that their jobs depend on timber sales, this arrangement tends to place timber harvests above all other uses.

IN WASHINGTON, D.C. the present Director of the BLM, Curt Berklund, is all for more timber harvesting. A Nixon appointee, he formerly owned his own lumber company. He speaks dreamily of such things as fertilization – despite the fact that no forest fertilization has ever been tested in southwest Oregon – and "second generation" genetically improved trees – despite the fact that the BLM hasn't yet planted a first generation genetically improved tree.

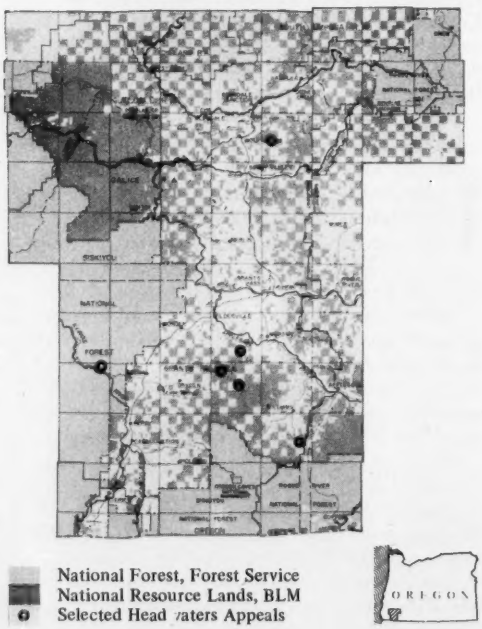
Under Stuart Udall, Lyndon Johnson's Secretary of the Interior, the BLM had some fairly responsible Directors. One, Charles Stoddart, warned Udall when he was appointed that, "You will have to fire me within two years." Before the prediction came true, Stoddart stifled several attempts to increase BLM timber harvests, especially in already overcut areas. Stoddart claims that the Bureau had people staying up nights to think of gimmicks to increase timber sales while appearing to practice sound management.

Many timber companies have overcut their own land and hope that Federal timberlands will come to their aid. Some counties in Oregon have the same hopes because they receive half of the O & C timber receipts. But, even some Federal land is overcut. BLM forester Robert Todd said of a proposed timber sale, "We are scraping the bottom of the barrel with this one." He was reprimanded by the comment: "We have been 'scraping the bottom of the barrel' for a long time. However, the position of the staff people is to review the plans for impacts which concern their area of expertise. Comments such as these are personal and are just what our bearded friends like to get a hold of."

INTO THIS PICTURE came Art Downing, San Francisco hippie. He has had an impact: The Roundtop Mountain sale, for example, was reduced by steps from 1700 acres to 250. Every time Art or his attorney filed a new motion, the BLM made another reduction. To counter Art's experts, such as myself, the Bureau hired its own consultants, and they recommended more modifications.

Unfortunately for both sides, the remnants of the sale still included the two or three streams from which Art and Paula take their water. So they insisted that the BLM should write an environmental impact statement (EIS) on the sale. (Congress passed the National Environmental Protection Act in 1969, requiring every Federal agency to consider the environmental impacts of all their actions. The most important section of the law states that agencies

JOSEPHINE MASTER UNIT



Close-up of clearcut patch with no erosion control.

must write a "detailed statement" discussing the impacts and alternatives for every "major Federal action significantly affecting the quality of the human environment." Since then, the Forest Service has written and is writing hundreds of EIS's, inviting citizen participation in forest planning and detailed technical review of all proposals. But the BLM has stubbornly been trying to see how long it can get away with doing as little as it can – and hopefully nothing at all – to comply with the law.)

In November, 1974, an administrative law court hearing was held to determine whether an EIS should be prepared for the Roundtop Mountain sale plans. It lasted three days, and like many court proceedings, was grueling. The first day, Art and his motley collection of experts – even the Forest Service Ph.D who appeared for Art had long hair, albeit white – made their case. The second day, the BLM experts, including the outside consultants who all visited the sale area for a single day the month before, testified and tore our work apart. The third day Art rebuilt his case by putting his key witnesses on the stand again.

We were all exhausted at the end. Bill Hutchison, Art's attorney, and I had worked on the case for over a year, mostly on a voluntary basis. Art and Paula, of course, had worked for much longer and at even lower pay. On conferring, however, we all agreed that the case had one weakness: now that the Roundtop Mountain sales had been reduced from 1,700 acres to 250 acres, would the judge consider the timber sale to be a "major Federal action?"

There seemed a good chance that he would not. To insure an EIS would be required for Art and Paula's land, it was clear that *Headwaters* would have to go one step further: *Headwaters* made a simultaneous appeal of *all* BLM timber sales in Josephine, Jackson and Klamath Counties. Together, these counties formed the BLM's Medford District. There could be no doubt that BLM plans here were a "major" Federal action. The Medford District contains over a third of the O & C land, which produced nearly 300 million board feet of timber a year which required the construction of nearly 200 miles of roads.

The suit alleged that BLM was over-cutting and not practicing sustained yield. It claimed that the "allowable cut" should be reduced. It pointed out that BLM regrowth projections for forests were based on northwest coast Oregon where there's lots of rain. Regrowth rates in southwest Oregon are a lot slower.

The Bureau of Land Management has a number of advisory committees, whose purpose is to demonstrate to Congress that the Bureau is seeking the advice and consent of the public. In western Oregon, the O & C Advisory Board is dominated by timber industry sympathizers – industry executives, county commissioners, and so on.

One member, representing the timber industry, remarked to me that "some agencies, which really don't want advice, set up advisory boards to make it look like they are getting advice. As long as these meetings don't take up too much of my time, I'm willing to play the game."

The most recent O & C Advisory Board meeting was in Grants Pass, the Josephine County seat. At the courthouse I asked a BLM official if he thought Art and Paula knew about the meeting.

"The notice was in the Federal Register," he snapped, apparently irritated that even I was at the meeting. Just then, a reporter for the Grants Pass newspaper, Paul Macomber, walked in the door. I asked him if the Board meeting had been announced in his paper.

"Do you know how we found this meeting?" he asked. "The City Editor was driving through downtown, and he saw a sign on a motel saying, 'Welcome BLM.' He wondered why the sign was there, so he called the motel and they told him about the meeting."

Federal regulations require that members of the public be allowed to speak, if they wish, at advisory board meetings. During the morning session, the Chairman made the repeated statement that "members of the public will be allowed to speak at 11:00. Anyone wishing to make a statement should let me know before that time."

I looked around the room. There were BLM employees in front of me, BLM employees behind me and BLM employees on both sides of me. Except for the newspaper reporter and the Chairman's wife, I was the only member of the public in the room and I had already told the Chairman that I wished to make no statement.

I ate lunch with Macomber, the reporter. I told him that I was surprised that Art could get along so well in Josephine County, which was known as redneck country where I come from. After all, when Art filed the lawsuit against the Medford District, stopping all BLM timber sales for 4 months, the Grants Pass paper had printed the exact directions to Art's house "just in case," it said, "any irate loggers want to beat Art Downing up."

"Art's different," Macomber said. "He can speak the language of a mill owner and make him understand where Art's coming from. They may disagree, but they won't be enemies."

[more →]

Young Douglas fir on old burn, Klamath National Forest

SHORTLY BEFORE *HEADWATERS* filed its appeal of all of the Medford District's timber sale plans, the Manager of the District, Don Schofield, wrote a memorandum to the BLM Oregon State Director. The results of a new inventory had just been tabulated, the memo said, and the conclusion was that the annual harvests from the District should be reduced by one-third. Schofield's memorandum requested that an official reduction be made. An influential paper in the area, the Medford *Mail-Tribune*, published the memo.

Most people took the news calmly. Timber company executives, county officials and prominent newspaper editors had all been aware that much of the land where the BLM was harvesting timber was marginal scabland. Sooner or later, they knew, the Bureau would have to reduce harvests.

One owner of a timber company told Art: "In making our future plans, I need to know how much timber I can expect to be able to buy from the BLM. If they have to reduce the cut, I'll live with it, but I need to know when. It's not knowing when and how much that could kill us."

Eric Allen, Editor of the *Mail-Tribune* and Vice-Chairman of the O & C Advisory Board, said, "If the BLM has to reduce its harvests, they'd better do it soon. The sooner they do it, the less the impacts will be on the local communities."

When *Headwaters* filed its appeal for all of Medford District, essentially supporting Schofield's memo, the appeal immediately stopped harvesting on all the timber sales mentioned in the appeal. There was still other timber (one and one-half years to two years of already approved timber sales) to be harvested. Timber was also available from the Forest Service and State lands. But, by contrast to the Schofield memo, this action sent the communities into an uproar.

A county commissioner warned the other counties in which the BLM had land, "If they win this suit, they'll be filing actions all over western Oregon."

The State Director of the BLM, Murl Storms, blamed the *Headwaters* suit on Eric Allen, the newspaper editor, for publishing the Schofield memo. Storms claimed that the memo was "preliminary information" and should not have been made available to the public. Allen angrily replied that all such documents are available for public inspection. Of course, *Headwaters* had planned the suit long before the Schofield memo was published.

Shortly thereafter, Medford District Manager Don Schofield received an order to attend a meeting of the western Oregon District Managers with the State Director. "When we got there," he reports, "Stormy (Murl Storms) said, 'We're here to talk about moving.' Then it was 'You'll go here, and you'll go there and you'll go over there.' "

All the District Managers were being transferred to other Districts – with the exception of Schofield, who was offered the Chief of Forestry position in the State office. Schofield considered the job a reduction in rank – the same pay grade, but a subordinate rather than a managing position. Schofield stated: "I felt it was an insult."

Schofield came to the Medford District about 1965 and was appalled by the persistent clearcutting despite repeated plantation failures. He immediately substituted shelterwood cutting over most of the District. This was not entirely original: Boise Cascade had been shelterwood cutting in southwest Oregon for over 15 years. But, Schofield was ahead of the Forest Service, which is still clearcutting in some dubious sites.

Schofield also had a prejudice against the liberal use of herbicides, and his administration used virtually no 2-4,D or 2-4,5,T. Moreover, in 1967, Schofield and Storms had taken opposite positions before the BLM National Director concerning old growth forests. Storms favored a more rapid liquidation of BLM's old growth, while Schofield felt that for economic and environmental reasons, liquidation should take place slowly and carefully. The position favored by Schofield became BLM policy.

Schofield believes that Storms, only recently appointed State Director. "has continued to work all these years to turn BLM policy toward liquidation of the old growth as rapidly as possible. I am convinced that this is the road to disaster for that part of western Oregon with which I am most familiar, the Medford District."

BLM employees generally concede that Schofield was offered a job he could not accept so that Storms would be rid of him. Schofield felt he would be "totally emasculated" by accepting the Chief of Forestry position and retired instead. At 54, this meant a severe pension reduction. Schofield was joined in retirement by the Salem District Manager, who had had his own battles with "Stormy."

Storms has shelved Schofield's request for a reduction in the allowable cut for several years. Moreover, Storms is almost certain to introduce herbicides into the Medford District. Herbicides such as 2-4,D are used heavily on nearby National Forests. It is also rumored that the Medford District will try to increase clearcutting as time goes on.

MEANWHILE, literally dozens of timber companies, counties and industry associations were intervening in the *Headwaters* appeal of Medford District timber sales. All of them filed motions to dismiss, motions for relief, and other actions. They knew that all such motions would be denied, but their hope was to so overwhelm Bill Hutchison – and the other *Headwaters* attorneys with paperwork that they could not competently handle the actual case.

The large number of intervenors also hoped that their numbers would impress upon the judge the economic need to continue timber sales. Jobs, profits and county revenues were more important than the BLM's overcutting, severe damage to the environment and flagrant breaking of Federal law by not preparing an environmental impact statement.

In February, 1976, a hearing was held to see if the BLM should be allowed to sell timber while the case was proceeding through the courts. Schofield gave testimony on his memorandum – but he was still District Manager at the time, and refused to make some of the stronger statements about overcutting and sustained yield which he made after retiring.

The intervenors produced several witnesses to testify to the economic calamity which would occur if the BLM could not immediately sell timber. The weight of this argument – if not the weight of the attorneys, seven of whom were in court for the government and intervenors, allowing room for only one of *Headwaters'* two lawyers to set his papers at the bar – seemed to sway the judge. *Headwaters* lost the hearing: the BLM was allowed to continue selling timber. Although appeal of the Medford timber sales was not lost it became clear that the BLM would stall the appeal while continuing to build roads, harvest trees, and otherwise impact the watersheds of southwest Oregon.

While *Headwaters* was preparing this appeal, the Natural Resources Defense Council also started a lawsuit against the Bureau, one which covered all BLM timber activities in 12 western states. (A similar suit regarding BLM's grazing management ended by requiring the Bureau to file over 200 environmental impact statements.) As a result of the NRDC lawsuit, the BLM agreed to write an EIS for Josephine County – which would not be ready until 1978. To placate *Headwaters*, the Bureau agreed not to sell a number of sales which *Headwaters* finds particularly objectionable, at least until the EIS is complete.

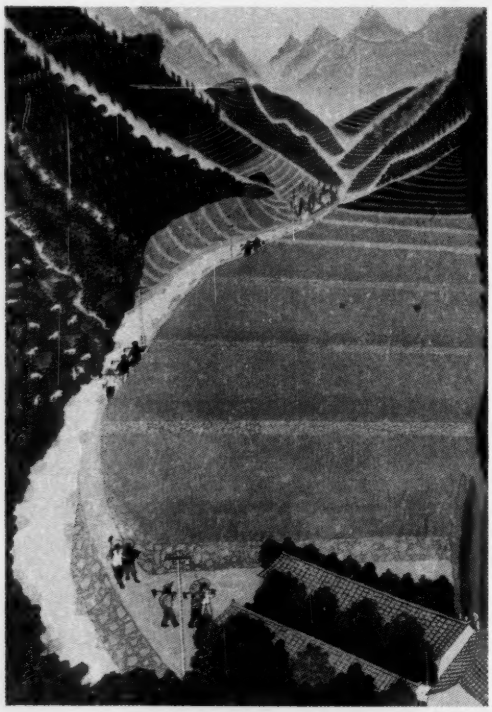
However, Art and Paula have studied the preliminary plans for the Josephine EIS, and they are not satisfied. "The Bureau is still trying to get away with as little as possible," says Art.

"The alternatives they are considering are terrible," adds Paula. " 'No Timber Harvest' – that's phoney, right? And 'More Rapid Harvest of Old Growth' – isn't that already illegal? There aren't any land use alternatives. The BLM still thinks that any land which has timber should have timber harvesting."

Whatever happens to *Headwaters'* appeals and lawsuits – none of which have been decided at this writing – the fight will continue past 1978 when the first impact statements are written. The battle has never seemed more hopeful than it does now. The most important victory has been won: the BLM can no longer do what it wishes, without the fear of public scrutiny. ■

Whose trees? Whose science?

In China, scientists plant trees.
Peasants experiment.



"New Mountain Scene" by Chao Chun-min

The illustration above and those on the following two pages are from **Peasant Paintings from Huhsien County***; published by Foreign Languages Press, Peking, China; 1974. 80 pages of color reproductions available for $6.45 postpaid from China Books and Periodicals, Inc., 2929 24th Street, San Francisco, CA 94110.*

This article (I have greatly condensed and re-arranged the text) appeared in full in **New Scientist** *(August 12, 1976). Jack Westoby is a former forestry official with the Food and Agriculture Organization of the United Nations. As the book blurb always says: "He recently visited China." The* **New Scientist** *(King's Reach Tower, Stamford Street, London SE1 9LS, England) is a weekly magazine of science: pure, applied, and political. Subscriptions by air mail are $44.30 a year or about $.90 an issue. –PW*

by JACK WESTOBY

IN 1949 CHINA WAS FACED with the consequences of two millennia of forest depletion, with tree cover down to about 5 per cent of the total land area. Afforestation was badly needed, especially for protective purposes, on a wide range of difficult sites, often on locations that had not seen trees for centuries. This meant a whole variety of new problems, with little technical experience to go on.

During the 1950s, claims from China for areas afforested, and number of trees planted, aroused the scepticism of Western foresters. But by piecing together the reports of lay travellers in the early 1960s, it became clear that planting had indeed been carried out on a tremendous scale. S. D. Richardson, an experienced professional who travelled widely in China in 1963, confirmed this, in **Forestry in Communist China** (Johns Hopkins Press, 1966), but drew attention to the fact that a good deal of the planting had taken place in unsuitable habitats, and that even where conditions were more favourable, survival rates were often depressingly low.

The *technical* reasons for the early failures are, in retrospect, fairly obvious, and Chinese foresters and forest workers now discuss these frankly: seeds of poor provenance, species chosen that were ill-adapted to the particular site conditions, shortcomings in nursery practice, badly organised transfer from nursery to planting site, poor planting techniques, failure to recognise and counter pest invasions, and so on.

Most important of all, perhaps, was that the primary emphasis was on getting trees into the ground, while the subsequent tending necessary to ensure their survival was neglected. In those days targets were often set, and achievements recorded, in terms of millions of trees planted, rather than in areas given adequate tree cover.

Travelling through China today one frequently comes across hills carpeted with green; new plantations with a uniformly high "take," established within the last decade. Projecting above the green carpet will be isolated stems or clumps of trees, the survivals of earlier plantings. Similarly, many rail- and road-side plantings display two distinct generations, the casualties of an earlier campaign having been made good in recent years.

Nearly all the early errors have been made good. Areas which were badly stocked have been replanted, and survival rates both in the replanted areas and in new plantings are everywhere satisfactory. Moreover, new planting proceeds at a prodigious rate. In province after province, forest workers told me: "We learned our lesson the hard way. Now 30 per cent of our effort goes into planting, 70 per cent into tending."

In China, at least nine-tenths of the total afforestation effort comes not from the state experts but from the peasants in the communes. In some communes forestry may be limited to line planting along roads and field borders, with small woodlots designed to produce locally some of the industrial timber needed in the commune, especially poles for construction and electricity transmission. In other communes, forestry will be a vital element in the agricultural programme, as in the case of dune fixation, shelterbelts, dyke consolidation, and the protection of water conservancy works. Or forestry may form part of a larger programme aimed at using land unsuitable for agriculture and laying the foundation for forest industries, thus diversifying the commune's economy.

Redistributing the Intellect

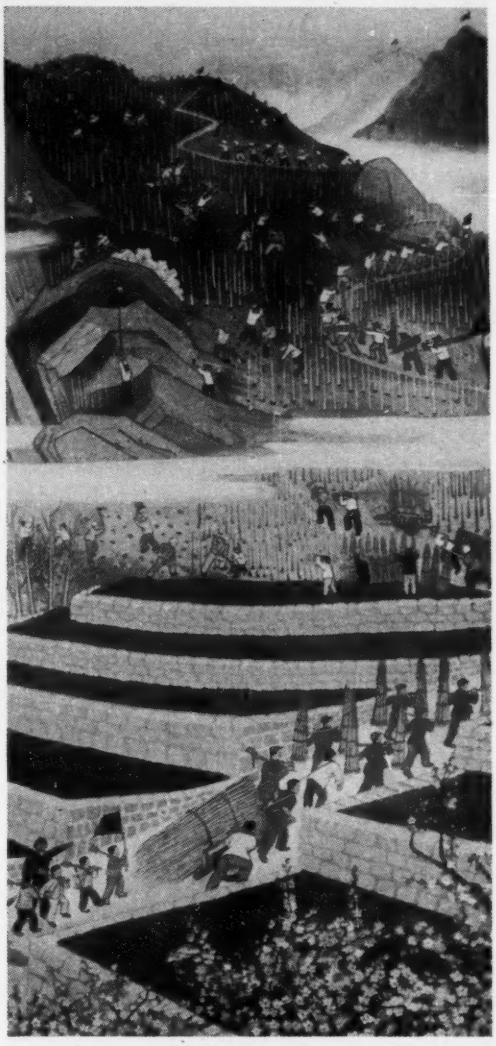
The Cultural Revolution completely transformed forestry education. As political struggles rose to a peak on the campuses, in 1967 and 1968, the forestry colleges, like other tertiary education institutions, closed their doors to new entrants. They were not re-opened for new admissions until 1970 or 1971.

Two of the main consequences have been a systematic devolution of responsibilities (state to province, province to county, county to district, and so on), and the emergence of new organs of management (revolutionary committees) at every level. Thus the Peking Academy of Forest Science has been relocated in Harbin, capital of China's foremost forestry province. The two forest research institutes have also been moved out of Peking, one to Nanking, the other to Ochun in Heilungkiang province. The well-known Peking Forestry College has been moved, lock, stock and barrel, to Yunnan province. What happened during this academic interregnum?

The Forestry Faculty of the Kwanting Agricultural and Forestry College is probably typical. Faculty members spent most of their time in the countryside, engaging in practical forestry tasks, initiating research, exchanging experience with the peasants. They organised trial courses for the communes, and gradually hammered out a new curriculum for the forestry college. When full-time courses were resumed in 1971, the new intake was very different from the old. It included workers, peasants, militia men and women. It also included many middle school graduates who had already acquired two or three years solid practical experience working in forestry.

Admission was subject to the recommendation of their workfellows, whose approval took account of political consciousness and attitude to work, not merely of academic attainment. The new entrants were older, more mature, more highly motivated than earlier student generations. They found themselves in a very different kind of college. The curriculum had been radically revised, more closely oriented to the needs of the communes, and the course had been shortened from five to three years.

The teaching staff of the forestry faculty at Kwantung now numbers 200, divided into three groups. One, primarily responsible for teaching, spends most of its time in the school, though making frequent visits with the students to the rural areas for both study and practical work. Another is stationed permanently in the rural areas, engaged on surveys, giving on-the-spot advice to the communes, and conducting local training as well as preparing textbooks and teaching materials. The third is engaged full time in research, commuting as necessary between the school and the countryside. Each staff member rotates among these three groups, so that all staff both tackle grass roots problems and carry out research.

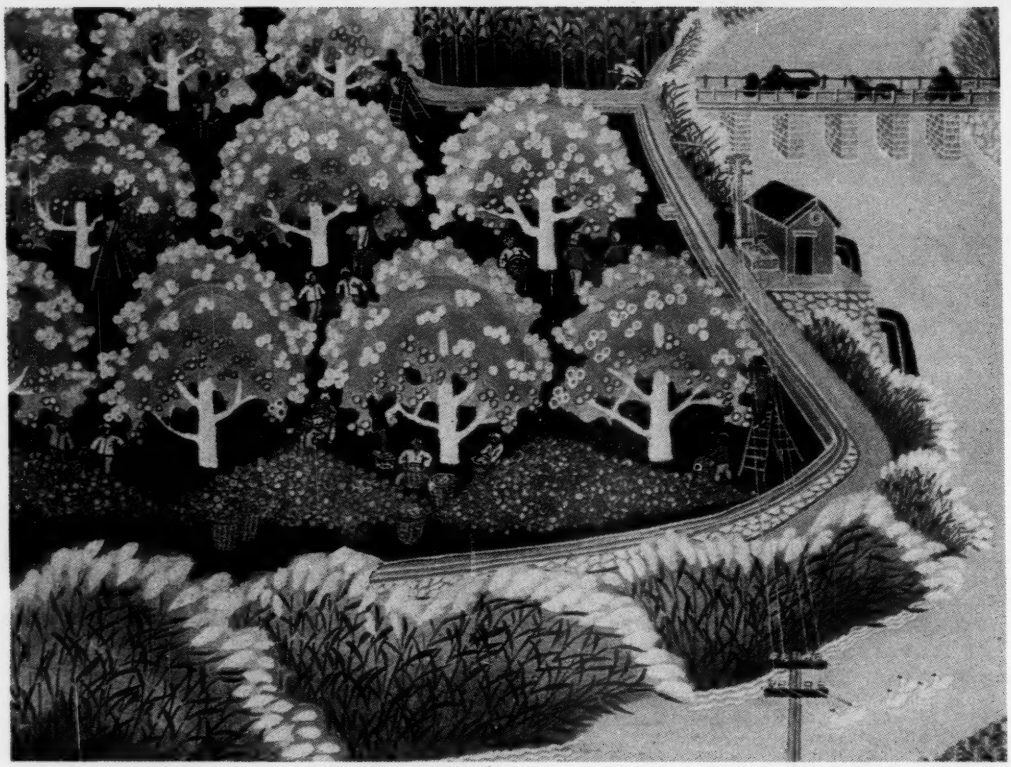


"Spring in the Chinling Mountains"
by Chintu People's Commune Spare-Time Art Group

Peasant Foresters

The scientific attitude, the scientific approach to problem-solving, is steadily gripping the workers and peasants. The Western forester visiting China today soon comes to understand that no dialogue with a man from the ministry, an academician, a machine operator, a skidder-driver, or a simple worker on a forest farm, is complete without a paragraph or two starting: "Summing up our experience to date . . . ." As a rule this is followed by a listing of open and unresolved questions, together with indications of the intended lines of attack.

Millions of peasants have taken to heart, and are vigorously applying, Chairman Mao's words, in a famous article written



"On the Banks of the Laoho River" by Cheng Min-sheng

in May 1963, urging them "to become good at investigation and study and at summing up experience." It is significant that the struggle for scientific experiment, along with the class struggle and the struggle for production, is one of the "three great revolutionary movements" set out in the new constitution of the Communist Party of China adopted in August 1973. The struggle for scientific experiment is not something that concerns "scientific circles" only. It concerns everybody.

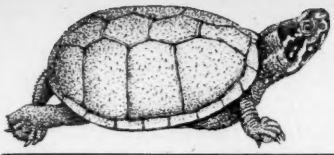
What exactly happens when the forestry scientist goes to work on a forest farm in the commune? Of course, he acquires an enhanced respect for manual labor, an appreciation of the peasant's hardihood, resource and commonsense, and this is a factor in breaking down the barrier between intellectual and manual labour. But the scientist is not expected to spend all his time mixing compost, leveling ground, picking out tree seedlings. He starts to exercise his mind on the technical problems that are actually giving concern to the peasant.

But surely forestry scientists from universities and research institutes visited the communes before the Cultural Revolution, I asked the vice-chairman of the revolutionary committee of a peasant commune in Kwantung. "Yes, of course they did," he replied. "But what did they do? They measured their sample plots. They copied out reams of figures from our records. They never seemed to have time to talk about the things that were worrying us most. Their minds were on the papers they were getting ready."

What distinguishes the Chinese experience is that, having revolutionized *physical* property relations, a sustained effort is being made to socialize *intellectual* property, to bring scientific knowledge under collective control. The contrast in the progress of the afforestation campaign before and since the Cultural Revolution springs not only from the scientific knowledge which forestry scientists brought to bear in the field; it springs also from the impetus which their presence gave to releasing the latent talent, imagination and energy of the peasants engaged in forestry work. The Kwantung peasant's words were underlined to me by forestry academicians, who explained that the reason why scientific journals ceased to appear during the Cultural Revolution, and are only now resuming publication, was that so many of the scientific papers published were aimed at advancing the careers of individual scientists, and had little relevance to pressing production problems.

No doubt, to many Western scientists, the idea of peasants conducting scientific experiments seems ludicrous. It still does, it would seem, to a number of Chinese scientists. One of the accusations levelled against Teng Hsiao Ping and his followers was that they "slandered the workers, peasants and soldiers as rustics unfit for scientific research because their 'cultural level is too low', in an attempt to exclude the masses from scientific studies" (**Peking Review**, No. 15, April 9, 1976).

In forestry, at least, the battle continues: to determine who owns scientific knowledge, who shall control science. Meanwhile, thousands of peasants working in forestry are conducting grafting experiments, germination tests, spacing trials, fertilizer trials, testing out exotic species and so on – steadily "becoming good at investigation and study and at summing up experience." ■



Turtle Island - 1976

The Delaware Indian name for North America was Turtle Island – the emergent shell, shedding water as the land rose from the sea. This section contains a few Turtle Island happenings in 1976. To me, they are the positive, hopeful direction of the continent.

In the sixties, many people migrated out from the city. Now, in the seventies, the "back-to-the-land" movement has matured. Many people realized there was no frontier, that "country" land is and has been inhabited. In the country, there was a need to understand rural people ("neighbors") just as there was a need to understand urban neighborhoods. Some people found they preferred urban neighborhoods and joined the "back-to-the-city" movement.

But, everyone involved matured in the sense that city-rural became part of one Big Picture. The seventies spirit no longer needs to isolate or oppose the "supply depots" of country to the markets and industry (like cars) of the city. This new, more integrated city/country perspective has attempted to find a new language. Gerald Myers (see "Healing the Land" on page 74) writes:

> **Ecotone: The ecological habitat created in the boundary between two ecological communities. The "edge" contains greater diversity of life than the habitats on each side.**
>
> **Ecotonian: A human member of the social edge between the urban industrial complex and the physical resource base that supports it.**

Seeking a more general language, Peter Berg of **Planet Drum** writes:

> **Reinhabitation refers to the spirit of living-in-place within a region that has been disrupted and injured through generations of exploitation. It means becoming native to places by developing awareness of their special life continuities and undertaking activities and evolving social forms that tend to maintain and restore them. Reinhabitation is neither a specialized field nor an "ecological lifestyle." It is simply becoming fully alive in and with a place. Reinhabitants differ from invaders as these were from the original inhabitants. They want to fit into the place which requires preserving the place to fit into. . . .**

Having lived in country and city, a clearer perception of ecology and economy has emerged in the seventies. This includes the advantages of human intensive labor for repairing land, making money off waste products, channeling capital into people's wages (vs. more people-eliminating machines), upgrading worker (industry) environments, using ecosystems where possible to replace hi-tech, labor-short equipment (flood plains vs. sewage treatment plants) and maintaining ecosystem health in order to maintain economic health. The motto seems to be: Conservation means Local Economy. Over-timbering has caused sporadic employment, estuary pollution has eliminated crab and shellfish industries, land fill has snuffed fish breeding grounds (and fishermen's livelihood), suburban land uses have destroyed nearby urban food supplies and jacked up food costs, etc., etc. It has become more and more obvious that upstream changes effect downstream life and downstream life (most cities are at the mouths of rivers which once were the most food productive) makes demands on upstream peoples.

Closely connected to conservation and local economy is watershed consciousness. Here, the seventies have shown some of the first offensive moves (watershed restoration) vs. the defensive moves (STOP the pollution!) of the sixties. Starting from strip-mined headwaters, monoculture forestry, clearcut riverbanks, silted-in trout streams, stagnant duck refuges, sewage choked kelp beds, the spirit has switched to reforestation with diverse, native species; aquaculture along the coasts, levee removal to open wetlands, ecological dredging to re-open estuary circulation, kelp and abalone progation and on and on. This is the "practical idealism" of the seventies. Try to heal the land, heal the economy with many small growings and heal human "nature" by reconnecting it to the Nutrient and Water cycles we live inside.

To practice these ideals, there have been many attempts to reduce bureaucratic government by creating Watershed Governments – a political body that could oversee water and land from headwaters to mouth. These ideals stretch back into the 18th and 19th centuries when there was hope that "natural" boundaries could replace political boundaries (especially in Germany). Some wanted the river to be the boundary; others the watershed divide. These ideals tended to work well in countries like France where waterways were the most important route of communication. But, the attempt to mark a "precise boundary" was always confounded by some cultural belief.

On the other hand, past thinking on watershed governments was always concerned with parts of the watershed – usually those parts useful to man. For instance, the Chinese irrigation proposals never connected deforestation in loess Highlands to the floods, silting and drought of the North China Plain.

Today's consciousness, seeing watersheds as "mini-biospheres" which act as a framework to connect happenings on the hillslopes with happenings in the valleys, provides the most holistic contemporary vision for regional planning. It contains a desire to locate Americans long enough to let them make friends with Mother Earth (most Americans move once in four years), to feel the pleasure of living-in-place. As Peter Berg expresses it:

> **Further "future primitive" aims might include developing contemporary bioregional cultures that celebrate the continuity of life where they live, and new region-to-region forms of participation with other cultures based on our mutuality as a species in the planetary biosphere.**

–PW

The Voices of Black Lake

Last May, at Black Lake, Michigan, 300 people representing organized labor, rural and urban community groups, environmentalists and minorities talked for four days and five nights. The national press hardly covered this National Action Conference: "Working for Environmental and Economic Justice and Jobs." While no Earth-shattering conclusions resulted, it was the first time that so many diverse groupings of Americans tried to get it together. The most positive, practical coalition between organized labor and environmentalists dealt with public health problems in worker environments. Here are a few of the many voices that speak for themselves. Halfway through the conference Russell Means and John Thomas of the American Indian Movement were shot. We start with a prayer. . . . —PW

George Barta

Sioux City American Indian Center, Iowa

Grandfather, as humble as I am and as poor as I am, I would like to talk to you just for a few brief moments and ask that you bless all of us here at this conference. Grandfather, there are many people here at this conference and they are from all different walks of life. Grandfather, there were many things said at this conference and many actions taken. We hope that the action taken by the people at this conference is going to be good action, action to keep from hurting our Mother Earth. We know this is very precious to you. We know this hurts you when you see this happen.

Grandfather, when this conference is going to end, many people are going to be traveling, and we want you to bless those people, and we want you to help us get home safe to our families. Grandfather, we have a lot of problems. Again, two of our brothers were shot. We want you to help stop this, Grandfather, because this *has* to stop. We really sincerely want you to do this, and then, Grandfather, I want to apologize to you if I am not talking to you in the right way. I am saying this from my heart, in that I have respect for all the people here. Although we have differences, we want them to think about understanding Indian people and understanding the problems of our treaties because they alone can help us, Grandfather. We are powerless in this system to do anything without the help of all these good people here.

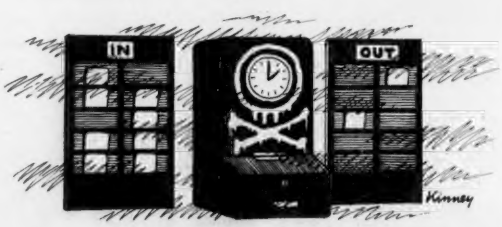
Grandfather, I want to close this and ask you to bless all my relatives, all the relatives of all the people here, those good people back home, those good people in the unions, those good people in the environmentalist movement, in the communities, and my black brothers. Grandfather, I have noticed in this conference when we have been here, that there were four colors here, the four colors we have used for thousands of years. There was the white and the yellow and the black and the red. There were people here from those four colors. I want you to bless those four colors and all those people, Grandfather. This I ask in the name of the Great Spirit. Thank you.

Barbara Newman

Investigative Reporter, National Public Radio (Moderator)

The labor movement has come to environmental issues, especially occupational health, quite late. They certainly were not at the vanguard of the proletariat in the last few years regarding a setting of standards for carcinogens such as asbestos, berillium and vinyl chloride. There have been two people who have worked very hard on this: Frank Wallich of the UAW, Tony Mazzocchi of the Oil, Chemical and Atomic Workers Union working with Syd Wolfe of Ralph Nader's Health Research Group. In terms of full-time commitments that is about it. The AFL-CIO and Mr. Meany have turned around on this issue in the last two years or so. They have convened high level task forces. Pete Bommarito of the Rubber Workers is very active in one of them and reflected at least in their writings, they are making an effort to try and see that Americans don't have to pay the price of their lives by the fact that they hold a job. The first time I did an occupational health story was about two and a half years ago. It was with Tony Mazzocchi and it had to do with a plant up in Hazelton, Pennsylvania where workers were being exposed to toxic levels of berillium dust and they would get an irreversible lung disease, berillium lung poisoning. Being a reporter, I found, my God, if they know that they actually have berillium lung disease, and several of them were identified as such by the Massachusetts General Hospital, wouldn't they be outraged? Wouldn't they think it terrible? Wouldn't they hate the company? Wouldn't they want to leave their jobs? I went up there thinking enthusiastically that that was going to be my story and guess what — it wasn't. They said, "Hey, girl reporter, we have to survive." Eighty-five dollars a week some of them made, and they continued to expose themselves to what they knew would be known death, because they felt they had no choice. One of them put it like this: "What's my choice, to stay and die or to leave and starve?" I found that over and over again with the workers in vinyl chloride and asbestos. They fight the efforts of their own unions, those who are trying to move them from toxic exposure of chemicals, high levels, because the fear of losing jobs is a very real thing.

Let me say something about the consortium of environmentalist and labor. My own feeling is that many people in the labor movement regard environmentalists as kind of middle class and upper-class snobs. The haves of the world who don't want to allow other people to enter the ranks of the haves, the people that say growth is not important, the people that say you must look for less material rewards in life. People who have the options to say that. The labor people I have talked with want. I think is a very human desire to try and better yourself so that your children can live better than you did. The things in life that some environmentalist might reject, they very validly see as theirs.



Tom Donahue

Executive Assistant to the President, AFL-CIO (Labor)

Let me take a minute to remind all of you of what the AFL-CIO is and what it is not.

1. It's 14.2 million people – organized in over 50,000 local unions – in 115 national unions functioning through 50 state federations and over 700 central bodies – holding over 450,000 general membership meetings a year and electing democratically over 100,000 officers every year.

Add to that the three plus million people represented by the UAW and IBT and their local structures and you begin to have a sense of what an amazingly complex and diverse institution American labor really is.

2. A second aspect of the labor movement to keep in mind is that it has at least two different levels of existence and functions.

There is first the level of job unionism or shop unionism – the level of basic membership participation and the level at which the expression of our unionism is largely concentrated on the job and on protection of the workers' job-related interests.

That is the primary function of American trade unionism. It's why workers join and it's the strength of American labor that its primary efforts are expended at that level.

The second function of the American trade unions is their social unionism. It can be expressed and carried out only so long as the primary function is fulfilled. That social unionism, in the long run or in the broad sense, may be far more important or have far greater impact on the lives of the workers represented – but it can only be carried out so long as the primary function is fulfilled.

Sixty million workers spend 25 percent of their active years in establishments where they may be – or are – exposed to deadly safety and health hazards – most of which are only beginning to be dealt with under the Occupational Safety and Health Law. That is our first environmental concern.

Growth provides our ability to reduce poverty. It is a precondition for the success of manpower programs directed to the needs of the poor. It provides the resources to build the housing, supply the medical services and upgrade the schools in the inner cities. Without it, we will never mobilize political support for domestic social programs, let alone for policies that offer new hope to the emerging nations.

Rustin quotes Anthony Grosland, the social democratic theorist and current Foreign Secretary in the British Labor Government: "My working class constituents have their own version of the environment, which is equally valid (to that of the no-growth advocates) and which calls for economic growth.

"They want lower housing densities and better schools and hospitals. They want washing machines and refrigerators to relieve domestic drudgery. They want cars and the freedom they give on weekends and holidays. And they want package flights to Majorca, even if this means more noise on night flights and eating fish and chips on previously secluded beaches. Why should they, too, not enjoy the sun?

"And they want these things not because their minds have been brainwashed and their tastes contrived by advertising – but because these things are desirable in themselves."

So we trade unionists look at the environment as I've said, first as it affects the worker on the job and in the community and secondly as it affects the poor and their aspirations.

He can only be asked to interest himself in the big picture, if everyone else is willing to interest themselves in his narrow, highly personal, job problem.

I don't think I said our job interests are inviolate. They are our prime interest. We're going to have to protect them because our function at the local union level is to protect that man's self interest and his interest is in his job. In the bottle and can, in the deliverable versus non-deliverable, I think the environmentalists started from the wrong position. Everybody started worrying about litter, and the way to solve litter was to keep the children from throwing away cans. Well, I think that was a wrong premise to begin with. When litter wasn't a sufficiently effective argument, the environmentalist moved from litter to saving our precious resources of aluminum and steel. The fact is that the bottle and can people have reduced the use of aluminum very, very, substantially in their production. Most recently, at least during 1975, the continuing argument was: we have to go to a returnable system because it will save energy. Well, nobody ever thought of that before, but it was a new argument, so suddenly we had to combat that argument. I just think that particular piece of business starts from the wrong premise. In terms of, would we accept some mechanisms, I think that's what I'm talking about, but again I don't know that I could be as specific as you'd like.

On the jobs question, I suspect that the construction trades jobs are there no matter what kind of energy-producing plants you choose to build, whether we build conventional plants or nuclear, the building trades jobs are there and they're the same. I really think the question of nuclear vs. non-nuclear, and I just don't know enough about solar energy, but I suspect maybe that's a mirror of the national problem, to really comment on part of David Brower's remarks. It may be that solar is the solution to all of our problems. But it seems to me from a practical and pragmatic sense that it is so far distant now that I'm unable to project how we might get where I think the society has to go using solar power. Where I think the society has to go is back to full employment, more jobs, and growth. To get growth we need electric power. Whether we get it by the nuclear route or whether we get it by conventional power is probably not a major item with the trade union movement as such. The fact is that we're going the nuclear way. That's the way we're told and the nation is told that's the economic way of going. I don't know, I don't know the answer to that. That's a decision really that the trade union movement's not making. Okay? You asked me about the jobs. I think the jobs are there no matter how you build that energy capacity, but I think essentially it's a question between growth or no-growth.

Question: Bill Ward
Great Plains Windustries, Lawrence, Kansas

National Science Foundation says that wind energy alone, one of the six types of solar energy that there is, can supply 23% of our nation's electrical needs for the year 2000. Twenty-three percent of the entire country's needs from wind-energy. A lot of that's in the Great Plains. Now are you going to build some windmills for us? That's my question.

Answer: Tom Donahue

No, we are not in the business of building windmills. As we all talk here, maybe part of the answer to how we work together is, God love us, that we each do our own thing. If your business is pressing the validity of wind as a source of energy, go to it. My business is protecting the work environment primarily. We are going to do our thing there. Most heavily, we are going to worry about clean air, clean water, the effect on community, but our primary emphasis is going to be on work place. The emphasis of the Friends of the Earth is going to be on the larger questions of our natural resource use. I think maybe the cooperation comes in each of us doing our own thing effectively.

[more →]

Robert E. Lee

United Rubber Workers No. 959, North Carolina

I'm Robert E. Lee. Those of you that I've met I've enjoyed it. I think we brought a little understanding together in these few days we've been here. One thing that I would like to point out: I came up here from North Carolina not knowing what an environmentalist was. So I got to discussing it in my core group. I thought it was people making $10,000 to $20,000 a year ripping off the federal government. I'm serious, I'm serious. Now let me bring a little education to some of you and note, that some. All right, I've experienced people here I guess with all types and different backgrounds of education. I've noticed some people, it appears to me, this is my own personal opinion, that you try to impress people with your education. Those of you that do this know who you are. People that try to impress people with their education don't make any sense at all. Let's come back together in about a year and get our stuff together a little bit better.

Gale Cincotta

Chairwoman, National Peoples' Action, Chicago

People live in neighborhoods, and neighborhoods make up cities. When we talk about environment to the environmentalists, they don't understand that environment includes the 10,000 abandoned buildings in Detroit, the 4,000 abandoned HUD homes in Chicago, the 2,000 in Wilmington, Delaware. The crime statistics are ever rising, and crime destroys our environment. As I heard my Indian friend talk last night about the disbandment of tribes, I was thinking that maybe the only place left where people live as tribes is the neighborhood, and that the neighborhood may be the closest connecting link between our various groups, the family — the tribe — the neighborhood.

If you put all the abandoned one-to-four unit FHA buildings in one spot, you'd have the 12th largest city in the United States. Empty homes, nobody living in them.

When you think about it, in Detroit alone, there are 10,000 abandoned buildings, and still when you talk about the economy, all you hear is that the economy is geared to new cars! That's just more encouragement to the "throw away society" that's been foisted on us, — that older people, older homes, older neighborhoods are expendable. It's so much a part of the publicity that comes out, that you have to have a new car, a new home or the economy will fall apart in a couple of years. We got Romney from Detroit for Secretary of HUD, and he built homes that fell apart like the new cars. We can no longer afford that.

When after World War II somebody made a decision that the European cities should be saved, they put together the brains and they put together the money, and they did it. Nobody in the United States has made that decision for American cities. Nobody in Congress has said that neighborhoods are important, people live in neighborhoods and they are worth saving. So let's develop a policy with incentives, tax breaks, subsidies, what have you, and we'll go on from there.

Ida Dean McCuien

Acorn, Arkansas

I'm from Little Rock. I'm from Acorn. Ida Dean McCuien. I would like to ask anybody here that is with HUD a question. What I would like to know is: why, when you go to the government, to HUD, do they give you the run around? I live in a slum government project. I live in North Little Rock. We have a project that was built over a swamp that was not filled in at the time. They told us, you low income people, you people that are disabled, you people that are drawing disability, you people that are drawing social security, we're going to build you houses. The houses are beautiful, yes. But they were shells. We are on a swamp. This time of year we have to live with parents, the older people have to go stay with children, because when it rains, you have a flood in your living room. If it rains a little bit harder, you swim in the bed. We have went to them. They have sent people there for four years straight to study. They always study in the dead of summer, no rain. I would like them to send someone to study now. I wonder why. We had wrote to Texas, to Washington. I can't go. I can't walk that far. I have a bad heart. I'm disabled.

Tom McElroy

Florida Audubon Society

Labor and all the jobs involved are putting Florida out of business and let me tell you why. The Associated Press just released through our tourist bureau the fact that during the Bicentennial Year of 1976, seventy odd million people will visit the State of Florida. That means one out of every four people in the United States will be in Florida before the year is out. It means that four thousand of them every week are going to stay there. It means that in Florida the construction industry is booming, it is providing jobs, it is usurping our water supply so fast that every few years Miami has to move its deep wells farther into the Everglades. On the other side of the state, it means that the city of Naples is moving theirs farther and farther into the Everglades. We are coming to the point one day where we are going to cross. The problem is: this is being done by getting rid of an equalizing pressure of salt water vs. fresh water. Unless labor, environmentalists, unless we all find a solution to this, we face the possibility in southern Florida, of having the only desert in the world with 60 inches of rainfall every year. Now, I mention this as being peculiar to Florida. I think it is not. I think we are just the forerunners, and I think on different scales this is happening throughout the United States.

Russell Peterson

Chairman of the Council on Environmental Quality

Some of our proposed capital-intensive projects are already getting a more comprehensive scrutiny than ever before. The Kaiparowits electrical generating plant in Southern Utah is a good example. As you probably know, two of the utility companies sponsoring the project recently bowed out. There has been speculation that environmentalists' objections killed the project, and there is considerable bitterness in Utah about its cancellation.

In fact, it appears that economics, pure and simple, killed the project. Environmental safeguards would have added roughly $600 million to its costs, and that is a sizeable sum. But the project was based on the electrical companies' assumptions that power demand in Southern California and Arizona would increase at the rate of 4.5 to 11 percent per year, for the years 1975 - 1980.

The actual rate of increase in power demand now forecast for California by some highly qualified analysts is only 1.4 percent – one-third the lowest projection, and about one-eighth the highest. It's noteworthy that the two utility companies announced their withdrawal only one day before they would have had to go before the California public service commission to justify their rates. I have a hunch that the costs of the Kaiparowits project, coupled with the lower rate of increase in energy demand, would have made that electricity the most expensive in the United States.

Whatever the truth of this matter, I was most struck by one fact: The Kaiparowits project, costing $3.5 billion, would have created 3,135 jobs for people in Utah after it went into full operation. That works out to $1,116,000 for every job.

In the recession economy of 1974 and 1975, environmental regulations forced expenditures that would not otherwise have been made. They put people to work: according to several studies that CEQ and the Environmental Protection Agency commissioned, about one million people are employed today as a result of the environmental clean-up regulations established over the past 10 years. This includes jobs directly involved in pollution-abatement, as well as the induced jobs necessary to service the former. Directly and indirectly, every billion dollars of environmental spending employs – depending on the nature of the expenditure – between 40,000 and 80,000 people. Some of these people, it is true, would have had jobs in any case, since most of the money spent on environmental clean-up would have been spent elsewhere without the environmental regulations. We figure, though, that 300,000 people who are working today would be out of jobs if it weren't for those regulations.

So far, the amount of unemployment caused by environmental restrictions has been minor. Since 1971, EPA – which operates an "early warning system" to monitor the impact of its regulations on jobs – has learned of 76 plant-closings affecting 16,500 workers – about fifteen-thousandths of one percent of the labor force. I do not want to minimize these losses. If your job was one of the 16,500, it's cold comfort to be told that as a result of environmental regulations, there are at least 300,000 additional jobs in the U.S. than there otherwise would have been.

Workers are more vulnerable to health problems caused by pollution than the typical American, for industrial pollutants are concentrated in the workplace. The workplace, indeed, requires concentrated scrutiny, for it has often given us the first indication of potentially broader problems. Almost every pollutant that has proven to be a hazard in the workplace has gone on to become a full-blown community problem – as witness, asbestos and vinyl chloride. Cleaning up the working environment will add costs to the products produced – costs that must be passed on to the consumer. But certainly that is only just, since the worker is bearing the costs now. If the proper safeguards had been installed at the Life Sciences plant at Hopewell, Virginia, the price of Kepone might have been substantially higher than its normal selling price. But look what has happened as a result of inadequate safeguards: a number of workers appear to have suffered severe and permanent nerve disorders; oyster fishing was halted for a time in the James River, and tests on Kepone levels in crabs as far north as Maryland and Delaware are now being conducted to determine if they are safe for human consumption; for a time, the municipal sewage-treatment system of Hopewell was knocked out, because Kepone destroyed its biological base; and the Commonwealth of Virginia, which initially issued reassuring statements about the modest harm done, has now joined a multi-million dollar suit against Life Sciences and Allied Chemical.

I think the environmental age will bring all of us humans – machinists, bird-watchers, Wall Street brokers, inner-city residents, truck-drivers, teachers, and astronauts – back into touch with a central fact of man's continuing existence: we remain dependent on our earth. We can manipulate it, convert its resources to our own benefit, and use our ingenuity to improve the quality of all our lives. But we can go too far, too fast – and one of the basic principles of ecology is that the symptoms of damage to an ecosystem do not show up until that damage is irreversible.

Environmentalists for Full Employment (EFFE)
1785 Massachusetts Avenue, NW
Washington, D.C. 20036

EFFE is a coalition of several hundred organizations. Their goal: to counter the myth being promoted by corporate America that this nation cannot meet current and future employment needs except by continuing to expose workers and the rest of us to deadly industrial chemicals, poisonous air and polluted water. The EFFE newsletter is solid reporting on employment and environment. It is free but tax deductible contributions payable to the Equilibrium Fund for EFFE will keep the newsletter active. –PW

Karl Limvere

North Dakota Farmers Union, Rural Caucus

We are family farmers, farmworkers, the rural poor, and those of rural communities. We are the people who are responsible for the stewardship of the vast majority of the nation's land and water resources. We are the ones who will have to live with the land and water decisions.

We are the victims of the bulldozers that are reshaping our land into non-agricultural uses, and in the process destroying our various cultures, our economic structures, our values, and our families. We all eventually suffer from this loss of agricultural production and the social dislocations.

If these developers can't swindle us out of our land, the increased land taxation pushes us off. Even if we still are somehow able to hang on, they use the power of government under the disguise of public interest and initiate eminent domain proceedings and condemn our land to build their subdivisions, transmission lines, pipelines, highways, strip mines, dams, reservoirs, and whatever else their imagination dictates on what used to be the source of our livelihood.

We want to support you in your efforts to revitalize the inner city and to let people work and shop where they live, because it reduces the pressure on our land for suburban development and highways.

We ask your support for farmland taxation on the basis of its agricultural productivity, to replace the present system of taxing it on the basis of a speculator's or developer's potential

profit. We ask for your support to limit the right of eminent domain. We ask your support for a land-use planning system that gives us the ability to have a voice in how our land is utilized.

We have this strange notion that the land should belong to those who work it. We ask for your help in stopping tax-loss farming by corporations and the wealthy. We ask for help in curbing corporate agriculture. They are not farmers with a land ethic. We ask you to remember that Meadowlarks Farms, Inc. is owned by AMAX Coal, and that Tenneco agricultural subsidiaries have become suburban developers.

We ask your help in enforcing the 160 acre limitation and residency requirements of the Reclamation Act of 1902 so that land served by federally sponsored irrigation systems can be taken out of the hands of agri-business conglomerates and placed in the hands of farmworkers in such places as the Westlands District in California.

We ask that the bargaining rights and health of migrant workers be protected. But more important, we ask that they be provided the opportunities to become family farmers. We ask support for the right for family farmers to bargain collectively with food processors and distributors through legislation similar to the National Labor Relations and Wagner Acts.

We ask support for new concepts of land tenure and structures to provide land opportunities for starting farmers through programs such as the Saskatchewan Land Bank Commission. At the same time we ask that you help redirect federal farm credit agencies so they serve the family farmer, rather than subsidizing or imitating the banker. We ask that USDA and the Census Bureau not be permitted to hide the plight of small farmers by redefining farms and thus removing them from the statistical data.

We ask these things because we believe that the small diversified farmer produces more jobs, better food, and more environmental protection.

We want alternate sources of power on our farms. We want technology that will give the family farm the competitive advantage for a change. We want an end to the production of technology at our land grant universities and by USDA for agri-business giants who view land only as the rooting zone for chemically-produced food planted and harvested without the caress of human hands. We want to stop exporting this technology through foreign aid programs.

These are the recommendations of the Rural Caucus. We do not represent everybody in rural America. We had no participants from the Farm Bureau, the local chamber of commerce, or the agricultural councils fronting for agri-business. We are not in full agreement among ourselves, but we believe we represent the rural forces that potentially can coalesce with other groups in this conference. We believe we can help reach your goals, and just as importantly we believe you can help us attain our populist notion that this entire society can live in an economic, social and representative democracy.

George Rankins

Urban League of Portland, Oregon

The very firm and stern faces here kind of upset me a little bit, so little smiling. Maybe we say we have nothing to smile about. We walk around looking like what I call the "average typical American." I've been trying to describe him ever since I've been here . . . the "average typical American" sitting at home drinking Brazilian coffee from his English cup with his feet on his Persian rug, eating nothing but Swiss cheese, after returning from seeing an Italian movie, in his German car, sitting at his Scandanavian desk, writing a letter to his Congressman with his ballpoint pen made in Tokyo.

The Black Caucus

While we appreciate the environmental concerns of the various groups here assembled, we perceive that the problems and concerns of the majority culture will be addressed and answered at the expense of those people who are powerless economically and politically to make the system work for them. . . . The environmental movement has developed into what appears to many minority communities to be an elitist class-oriented movement. . . . Environmental impact statements ought to be balanced with community needs for housing, jobs, transportation, energy. . . . Urban and recreation neighborhood designations have been promoted to exclude the needs of low income and non-white people. . . . Urban environmental development is being utilized to displace minority people in core areas of cities, and such activities follow the trends of the urban renewal programs which increased, rather than decreased, urban problems. . . . If environmentalists are going to challenge industrial sites which may result in a substantial loss of jobs by the displacement of industry, there is a responsibility on the environmental movement to help that community find alternative job sources. . . . The cost of air pollution control devices are usually passed on to the consumer, and the poor consumer normally pays a disproportionate amount of money for consumer goods. . . . We are concerned that unions may once again oppose the retraining of minorities in the emerging environmental/energy industries. . . . Unions should provide more direct support for community groups who are concerned with social and economic justice and equity. . . . We are concerned that the legitimate rights – by treaty – of the Indian peoples have not been honored to date by our government.

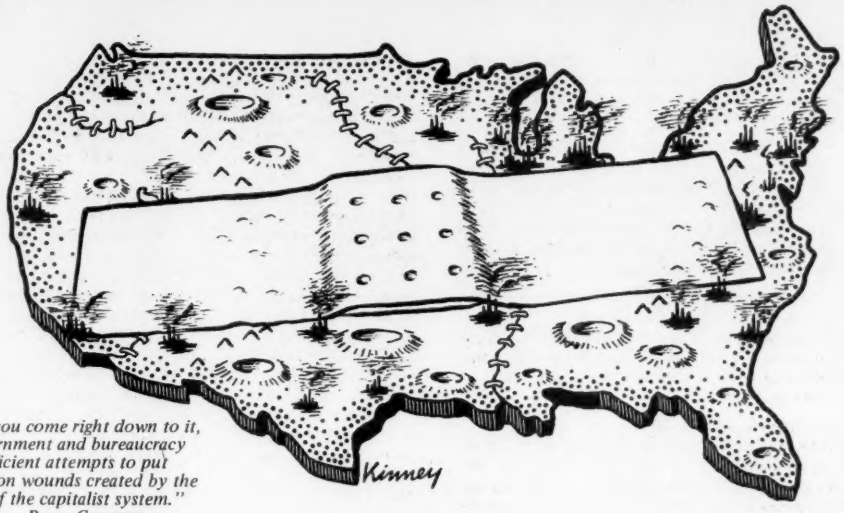
Barry Commoner

Director, Center for the Biology of Natural Systems, Washington University

If you look at the problems that have been troubling all of us in this room – the conflict between resources, environment, jobs, and so on – and can trace back and find the reasons, you find that they are built into the operation of the capitalist system. I say that as a scientific assertion. Incidentally, I was a little worried about my barging into economics until the other day when I gave a talk and a Nobel laureate economist was sitting right behind me on the platform. After a while I turned around and asked him how I was doing. He said, "A-plus." So I guess at least one economist agrees. But I think it's clear that there is a deep inherent fault in the operation of the capitalist system – that decisions about what to produce and how to produce it are made in order to maximize profit. The things that we're worried about in this room emanate from that fault.

This production system that has been driven to maximize profit is the same production system that has polluted the environment with detergents, with smog, and with toxic chemicals. The new industries that have displaced natural raw materials are the more profitable ones. They are more profitable because they depend less on labor. The electrons that they use are cheaper than labor – and they do not go on strike. In its drive to maximize profit, U.S. industry has drastically changed the means of production in such a way as to make unemployment, the waste of energy and capital, and environmental pollution inevitable. There is something seriously wrong with the economic system. And that fault lies behind all the problems that we are wrestling with at this conference: jobs, the conservation of resources, and degradation of the environment.

Another aspect of this issue is the enormous cost and the bureaucracy of the government. EPA, for example, is after all a bureaucracy. It doesn't spend as much as some government agencies, but it's still a costly bureaucracy. What is it



"When you come right down to it, big government and bureaucracy are inefficient attempts to put patches on wounds created by the failure of the capitalist system."
–Barry Commoner

doing? It is attempting to patch up the damage caused by the free enterprise system. It's saying, "Well, now that free enterprise has given us a disastrous system of private automobiles, let's see if we can manipulate traffic, regulate gas mileage, and stick gadgets on the tailpipes to catch pollutants, without hurting free enterprise by forcing a major redesign of the auto." This is a crazy way to solve the problem. The more efficient, less bureaucratic solution is to produce better cars.

Mr. Reagan's belief that socialism necessarily leads to bureaucracy is completely backwards. Here is the best example I know: unemployment. First we throw someone out of work by increased labor productivity. Then, for moral reasons, we decide this person shouldn't starve. Now there are two ways to feed an unemployed person. One way is through going down to the unemployment office, filling out forms and getting interviewed. Then the cards get punched, the computers whirl, and eventually out comes the check. Now, that's a lot of bureaucracy. The other way to keep us all fed is to build a production system that provides decent jobs for everyone who can work. The entire unemployment bureaucracy is a wasteful way to use social resources when it would be much simpler to see to it that the production system guaranteed jobs.

Now the next question is: What do you do about it? I think there is no way to reform it that hasn't already been tried, and didn't just make some other aspect of the situation worse. OSHA (Occupational Safety and Health Act), for example, certainly helps protect the worker against exposure to the faults in the means of production. But OSHA reduces the productivity of capital – there are no two ways about it. When you put a protective device in a factory and all it does is save the worker from injury or death without producing output, it reduces the productivity of the capital, and often enough, of labor. In a similar way, the current attempts to solve the energy crisis – through nuclear breeder reactors, coal gasification and the manufacture of other synthetic fuels – also require more and more capital to produce the same amount of energy. Such attempts to reform a part of the system just doesn't seem to work.

What's needed in the United States is an open public debate on the relative merits of capitalism and a socialist economic system. When I use the term "socialist economic system" I have in mind a specific definition. It's a system in which the design and functioning of the production system are under public control: the wages, what's produced, how it's distributed, and so on. The question of how you do that politically is wide open. I don't think there's a good example available. The Soviet Union is socialist and so is China, and look how different they are. And the two biggest western Communist parties have just given up the principal of the dictatorship of the proletariat. I think that there's no point in saying, "Oh well, we know exactly how to do it." Anybody who says that doesn't know what he's talking about.

We would need to invent new political forms that combine the economic democracy of socialism with the political freedom that is such an important part of the American heritage. I have no suggestions to make about how to accomplish that. At the moment I think of my job as trying to raise the issue. I think as we debate this issue, we'll find ways of working out answers to the political questions, but the debate is the essential thing now. If the issues raised in this room do nothing else but to encourage the people of this country to begin at last to look this issue in the eye, I think we will have really saved jobs and the environment.

George Barta

Sioux City American Indian Center, Iowa

We believe that rampant consumerism and industrial progress have sown seeds of their own destruction because the resources of the earth upon which these things feed are limited. We therefore urge Anglo-Americans to return to a simpler life or they will destroy us all. Americans should strive to be satisfied and happy with all they have instead of basing their happiness on how much they can amass and construct.

We believe that the profit motive in this society is a cultural problem and not an economic one. If Americans are seeking to replace profit as a method of motivating people, they should not look to coercion but instead to their culture and view of life. People in societies closer to the earth are motivated by means other than offering them material rewards for acting in a certain way. If non-Indians coerce themselves they are more likely to coerce others.

We believe that land and people are one. We believe that only people with an integral relationship to the land can survive. We consider the land as our church, thus the destruction of the land is equal to the destruction of the cathedrals of Europe and the temples of Asia. We view this preservation of our natural land as our right to freedom of religion and our right to freedom of worship. ■

Michael Alexander

Michael Alexander

Christo's Running Fence

Photographs by Barbara and Paul Kayfetz and Michael Alexander; Text and Captions by Peter Warshall

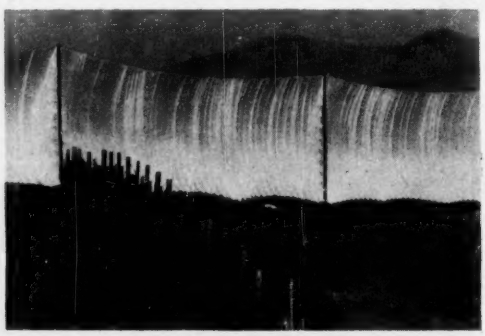
When I first met Christo, at a lunch after the State Coastal Commission turned him down, he was busy re-routing the Running Fence. He had pushed his plate and fork to the side and buried himself in a USGS topo map. Every time he got a new idea, he would ask a rancher if so-and-so would let them run the fence through their land. He would ask the engineer about the slopes. He would ask the lawyers about the coastal zone laws.

The Running Fence was 24 miles long. It was like a strange species of water: it could run up-hill and along ridges, flow past rocky outcrops, through woodlots and across ravines and over marshes. It also had the strange ability to stop (at roads) and begin again. The Running Fence would have entered the Pacific by way of an estuary but the estuary was considered too precious. So, the Coastal Commission made the fence run on the ridge and straight over the edge. The running fence would have glided from watershed divide to watershed divide with complete grace but, rarely, a property owner refused him permission so the fence wandered gracefully off around the property.

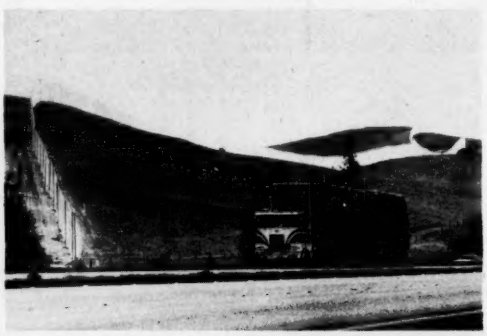
Throughout, the fence balanced natural landscape with cultural landscape. It was a fence but it ran through fences. It made gates between neighbors where there were no gates before. Like water or wind, it unified landscape preventing the eye from stopping at property lines and astounding the eye emphasizing hillslope forms and continuity. In the same way that a river doesn't care who it floods, the fence moved seemingly without concern through human constructs: property, roads, towns, subdivisions, rural life, suburban life. There is no doubt that it was Christo's imaginative and topographic brilliance that made the watershed contours of the gold, sheep-grazed coastal prairie of Sonoma sparkle in new ways.

"The 'Running Fence' will bring out the contours of the Sonoma hills and the seashore, the changing of the weather. The 'Running Fence' is a celebration of the landscape. The physical reality of the 'Running Fence' will be a beautiful one. The fabric is a fragile material, like clothing or skin. And, like the structures that the nomads built in the desert, it will have the special beauties of impermanence. The fabric is a light-conductor for the sunlight, and it will give shape to the wind. It will go over the hills and into the sea, like a ribbon of light."

–Christo Javacheff



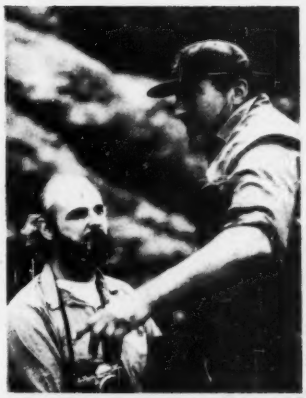
Michael Alexander



Michael Alexander

Kayfetz

Ranchers and other locals in Sonoma got a chance to watch their government at work without running any risks. Christo's lawyer discovered that any fence with posts sunk three feet or deeper needs an excavation permit. But, if you put fence posts in less than a two-foot hole (a lousy fence), you don't need a permit and you don't need to pay a permit fee. Ranchers who had never before even bothered with fence permits suddenly understood: Bad fences are free of charge and good fences mean hours of hassling with local bureaucrats.



Kayfetz

Christo has personal magic. He can talk to anybody in a comfortable manner. He brought together postmasters and aerodynamic engineers, botanists and sheep ranchers, lawyers, art museum directors and rancher's wives. Many roles were reversed. "Experts" learned from local farmers who had never been to college. "Lifestyle" labelling which usually acts as an excuse to avoid another American fell apart. As I flew back from San Diego with Ed Pozzi, a sheep rancher (right), we exchanged notes. He pointed out the military defense system of California, while Dennis Breedlove, a botanist with the California Academy of Sciences (left), and myself pointed out watersheds, rivers and sewage plants.

SOCIAL STRUCTURE

Christo not only exposed the natural landscape under the cultural overlay, he exposed the prejudices, foibles, humor or humorlessness as well as the social structure of California to whomever got involved.

Art confronted the mystique of rational Science and made it look bezerko. Art confronted Government authority and made it seem like children roving in Never-Never Land. Christo confronted "reality" and created a ribbon of light.

Kayfetz

Kayfetz

Opposition naturalists and environmentalists got totally twisted by the project. Virginia Hechtman (left), who helped stop a nuclear reactor on the nearby San Andreas fault, suddenly turned art critic with an "environmentalist" cover story. In a kind of Bambi Terrorism, she testified that deer would become prime targets outlined against the fence and that hunters would not be able to resist trespassing to shoot them. Deer would be trapped by the fence (though it had huge gaps for deer) and cut them off from water. They would die of thirst. She worked with the incredibly fine marine biologist and conservationist Joel Hedgpeth (right). He testified in writing that the Running Fence, by passing over a stream, might kill the brine-shrimp in the water below it. Friends of Wildlife wrote: "There will be [birds with] broken necks and wings so there will be wounded and dead birds just like there were in Santa Barbara oil goo." Stan Pitcher, President of Audubon Canyon Ranch, said the birds would have to be dumb, blind or crippled first. This level of argument left many naturalists wondering who had bird brains.

Kayfetz

On the Left in Back is Bill Wheeler, painter, who wrote "Where Did All The Communes Go?" in the Winter 1975 **CQ**. *He lives in Sonoma and supported the Running Fence. Michael Goldman (in knit cap) is a landscape architect/artist who is also pro-Christo. The McChesneys (standing on right) were prime artist opponents to Christo's fence.*

[Note: After the Running Fence was removed, no environmental damage could be found.]

[more →]

THE MAKING OF AN OUTLAW

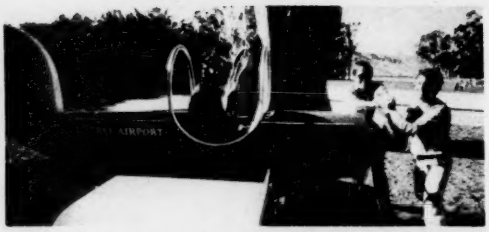
January 1975: Christo began his permit-getting. The Marin County Planning Commission denies his application. He appeals to the Board of Supervisors and wins approval.

June 1975: Christo's first route includes the Estero San Antonio, Sonoma County. Some people feel this area to be "environmentally delicate." The State Coastal Commission denies him a permit. In addition, the project is stopped by a court injunction, requiring an Environmental Impact Statement.

August 1975: The injunction is overturned by the California Court of Appeals. Christo decides he will have a better chance of obtaining permits if he writes an EIR anyway. Project is postponed for one year.

June 1976: After moving the Running Fence from Estero San Antonio to a "less delicate" location on the ridge, Christo still receives an unfavorable staff reaction from the State Coastal Commission. After 16 hearings, 7 County, State and Federal permits and over $50,000 spent on EIRs, Christo decides without telling anyone to go outlaw.

July 1976: Christo starts postponing his hearing with the State Coastal Commission. Changes dates. Doesn't show up. The Trickster in Christo has replaced the "Yessir, I'll move the fence this way. Yessah, I'll move it over there." Quietly, he even deludes his own lawyers who had carried him through all the bureaucratic marshmallow. He decides the First Amendment gives him the right of free expression – not an uncommon thought for the Bicentennial. Of course, it has been 200 years, and luckily you can't just do anything you want with American land. Even Art has its responsibilities. (I can see PG&E building new power plants without environmental impact reports by calling the power plants Art and "free expression.") But, there is a point when government control does become absurd, especially when the local governments, which are more intimately acquainted with the land and people have approved the project. Only the more distant State Commission with many members that have never even seen the landscape and/or met the people disapprove of it. So, Christo decides he's righteous because of local approvals (even though local approval in no way eliminated the need for State Coastal Commission permit).



Kayfetz

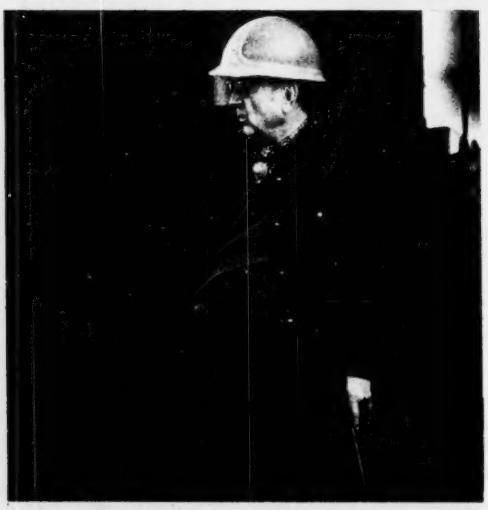
Christo's lawyers before he left them with legalities and went his own Robin Hood way. (From left to right: Christo, Howard Nemoroski, and Paul Kayfetz.)

The Lawyers who have conscientiously played legal roles for Christo, continue to do so. Christo, in his silence, has dropped out of the law.

August-September 1976: The Running Fence goes up to the Coastal zone (1,000 yards from the shore). Christo assures his contractor that the last stretch to the ocean is legal and the contractor completes the run to the Pacific. The Attorney General is seeking fines ($500/day) for the two weeks the fence is up ($17,000 total). The Army Corps of Engineers tries to decide (no verdict yet) if they should bring criminal charges (up to a year in jail) or civil charges (additional fines). Everyone agrees: (1) The Running Fence caused no environmental damage; (2) the Army Corps is not well-known for its tender care for the land and ocean coasts of America; (3) the $17,000 fine is not significant given Christo's $2-1/2 million total cost for the Running Fence. One of Christo's collages sells for $20,000.

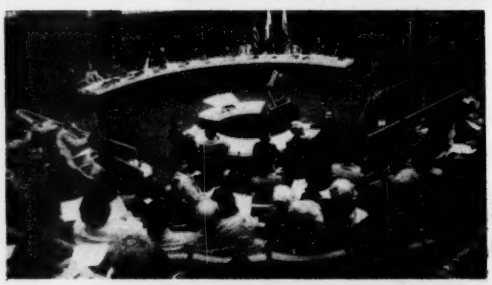
" 'Running Fence' is art of people. It is the only work of the twentieth century that is art of people. And is subversive. I could go build my beautiful fence in Africa with no trouble, no problems, but I would be cheating. Challenge to the structure of society is exciting, is subversive. In 'Running Fence' men and women arguing about it play a part – are part of a work of art."

–Christo Javacheff



Kayfetz

Ted Dougherty, the contractor. Christo told him it was legal to run the fence into the sea. It was only logical and beautiful. His contractor's license could be the only "casualty."



Kayfetz

Just as opposition "environmentalists" made marshmallow of their own vocabulary, the State Coastal Commission looked worse. In 1976, they had approved the San Onofre nuclear power plant causing 3½ miles of coastal land to be stripped bare and allowing the nuclear plant to pour hot effluent into the Pacific. ("No significant environmental damage.") In sight of the submerged part of the Running Fence, the State Commission approved a court settlement that allowed Bodega Harbor to build a one-thousand-unit ticky-tacky subdivision on beautiful coastal bluffs. ("No significant environmental damage.") But Christo's two-week Running Fence on mostly overgrazed rangeland and essentially an extravagant clothesline was rejected – possible environmental damage from being too popular with Bay Area people.

CHRISTO'S ECONOMICS

Economics, the flow of materials, energy, jobs and money, took peculiar turnabouts during the Running Fence project. People obsessed by money were, not surprisingly, obsessed with Christo's money. But Christo, who was trained in Marxism while a youth in Bulgaria and called himself a "socialist-realist" when he was 20 years old, did not appear to be after personal financial gain. He seemed more like Robin Hood selling 5 stretched blank canvasses wrapped in a tarpaulin for $45,000 "to people in New York who can afford $500 dinners." Then, he funneled huge amounts of the finances into materials and jobs: from the "haves" to the "have lesses."

Usually, Pacific materials (wool for sweaters, California foodstuffs) go to the Atlantic seaboard to be sold for money. This time materials and money came from the north-east and stayed in Sonoma County, California. Nylon (165,000 yards) that was destined to be air-bags for car safety was found defective, rejected, bought by Christo, assembled into "curtains" in a West Virginia factory. Some of the nylon now covers haystacks, tractors, and manure piles. Similarly, the 2,200 steel poles were scheduled for Vietnam airports. Many are now corral posts for milking barns. The finances (92%) came from Europe – enough to make any enterprising American economist envious. Some of the finances wound up in the pockets of hard-pressed cattle and dairy ranches. Some paid students to construct the Running Fence.

Michael Alexander

Kayfetz

CHRISTO JAVACHEFF

Let's start with what Christo's art is NOT. It is not forever. It lasted two weeks. It is not individual in its production. Hundreds of people worked on it. It is not Museum Art. The light is the light of sun and clouds – dappled and changing. It is not even flourescent light or the overhead baby spots of galleries. In other words, it is outdoor art. Not in buildings. It is not elitist. Everyone and anyone was welcome to the opening. No one sub-group of America cherished it. Finally, it was not a product. Christo said his Art *was* the process, however it happens. He said:

"You will be able to buy pictures of my 'Running Fence,' but no one will ever own it, and it will be gone forever. That is subversive to values of society. I am accused of using system, and is true. And I almost laugh at system. System in America is to make money, and I don't make money, I pour all money back into work. People who oppose my work are very conservative, very reactionary. By using system, it is humorous. And art should have humor – and irony. I consider myself everything: serious, mockery, everything. Take Shakespeare. He had everything. Except his art is make believe. Like all other art is make believe. But my art is real. This is my power – everything is real. I work with sun and wind and congressmen and senators."

" 'Running Fence' is beautiful, a visual experience. What is happening in California is revitalization of people's thinking about their land. In nineteenth century, Van Gogh and Cezanne paint landscapes of provincial France. Make people see Cezanne's Mont-Sainte-Victoire in different way. Now, I make people see California hills different. Whole revolution in contemporary art is only formalistic. Artist always same – always supreme master." ■

HEALING THE LAND

The Redwood Creek Renewal Project

EXCERPTS FROM THE PROJECT PAPERS OF GERALD MYERS

ME

Gerald Myers, born 4/22/39. Dad, grandad, and great-grandad were Douglas fir gyppo loggers, and I grew up in Oregon and Washington logging towns. Graduated in '60 with a BS in Bus Ad, minor in Geology, 2d Lt. commission in the Infantry, and two goals: to make $1000 a month by 30 and be a corporate president by 40.

Graduated top of the class UC Berkeley in '61 with a MBA in Industrial Relations and Personnel. Couple years Army yielded me an honorable discharge as an airborne qualified, ranger trained Infantry captain and some interesting skills.

Got married, got a son, started up the corporate ranks. One year in personnel bored me stiff, got transferred to systems work. Next 7 years in systems with PG&E, SCM, and UC MIS project. Got divorced, did gestalt therapy, grass, acid, people's park – and changed.

Married a fine lady, sold my sports car, bought a VW bus, and took a sabbatical while I grew hair and wrestled with what I wanted to do with my life. Set down in a rented house in Redway (near Garberville, 70 miles south of Eureka), did a craft trip for a couple of years, another son entered my life, and bought 40 acres of steep, logged-off ranch land on the Briceland Ranch. Built a couple of domes and started the land trip.

My wife has a trust fund which yields us a modest ($500 month) income. For the last six years I have been able to flow into the question of what I wanted to do with my life. As it turned out, I didn't find it - it found me.

Redwood Creek Renewal

One very hot Sunday last August, a bunch of people were down at the local skinny-dip swimming hole. The grown-ups were in the shade discussing baby Beginnings (a pre-school) hot and heavy. The kids were in the creek (smart kids!). In the middle of all this one of the mamas yelled to a child, "Don't drink that water, you'll get sick." That wasn't too scientific, but it was rational; the low flow creek in the summer is pretty unsavory.

The remark stuck. That night when the sun went down and things cooled off and everyone else was asleep, I sat on the ridge I caretake and looked out over about half the drainage basin. My background gave me a pretty fair handle of what was happening: gyppo logging, lousy roads, steep terrain, sedimentary soil, and wet winters were eroding the works at a fantastic rate above "normal" in winter. Old houses and septic-tanks were dumping contaminants in summer.

So I pipe-dreamed an idea: package up a project, sell it to an appropriate government agency or two or three, and put myself and a bunch of my friends and neighbors to work patching up this mess.

Then I calculated the costs – to me. And I forgot it and went to bed.

But it wouldn't forget me. The damn idea kept cropping up at all hours in all ways: "It's your heritage, this ripped-off land. What are you going to pass on to your kids?" "Who's got the guts to take responsibility for a whole drainage basin?" "The sooner the job is started, the less the overall damage and the easier to fix the damage done." "How come you left the woods and paid 13 years dues learning all that bureaucratic crap just to live in the woods?" On and on.

So I tentatively started doing some research. Reading books, taking notes. Right off stuff started jumping out:

* The Eel River drainage basin is the fastest eroding basin in the U.S. today. The Feds are "concerned." Our Congressman is "concerned." (This year the Corp of Engineers got $50,000 to study the problem – $50,000 will get two-three field trips and a report recommending the government give the Corp umpteen billion to build 67,237 concrete retaining walls.)

* The consequences of accelerated erosion are well documented, and may be divided into three categories:

"Every time it rains around here, a whole lot of real estate changes hands." (Private conversation: February, 1976)

1. Land
   - A. Loss of productivity (diminished soil resource)
   - B. Loss of physical area
   - C. Limitations of potential future land use
   - D. Endangered developments
   - E. Increased cost of land operations
   - F. Destruction of recreational and esthetic values
   - G. Increased run-off rates
   - H. Adverse impact on local economy
2. Water
   - A. Periodic effect on water quality (of all the water on earth, only 0.35 percent is drinkable)
   - B. Increased intensity and frequency of bedload
   - C. Aggradation of streambeds
   - D. Decrease in bed-material particle size and reduction of intergravel oxygen
   - E. Shifting of channel
   - F. Destruction of fish and wildlife habitat
   - G. Limitations on reservoir construction
   - H. Slowing of plant growth, which affects food chains and oxygen supply
   - I. Decrease of recreational and esthetic values.
3. Downstream

   Increased runoff and sediment deposition can affect downstream users through increased flooding and destruction of cropland.

* There is nothing magic about soil erosion, or its consequences in nearby rivers and streams. The process within our basin is clear – careful observation of one major winter rainstorm and its effects on various basin lands and the creek will provide the basic understanding.

* Neither is there any magic in stopping, preventing, or modifying the rate of soil erosion. The principles are well-known: maintenance of vegetal cover and controlled runoff. Application of these principles to the unique soil/

terrain/climate of the Redwood Creek basin will take thought, care, and planning. But no new technology or sophisticated materials are required.

* The benefits of watershed management and ecosystem repair are equally well documented, and include:

1. Sediment yield reduction
2. Increased land productivity, with consequent long-run economic base benefits
3. Increased vegetal cover
4. Decreased run-off
5. Flood control
6. Improved water quality
7. Improved fish and wildlife habitat
8. Increased beauty and recreation potential (fishing, sightseeing) with consequent economic benefit of counter-cyclical extended tourism. (Winter "salmon derbies" to offset the seasonal wood products and normal tourism employment pattern.)

* What IS required is a project approach that recognizes the social context within which the project operates. The community of people within the Redwood Creek drainage basin are facing a unique economic paradox: Population growth and economic depression. Since 1968, basin population has grown from approximately 80 to over 500, and continues to grow. The under-employment rate is probably in the 60% area. The actual unemployment rate exceeds 30%.

From the turn of the century until the late 1960's, the basin's economic base was resources: tan oak, redwood, and fir. Three relatively small ranches in the valley provided a living for a few families. After the exploitation of the old growth timber, about one-half of the basin was sub-divided into small land parcels (40 acres typical). These parcels were purchased by the so-called "back to the land" movement, – mostly young, mostly city born and bred, mostly well educated. The newcomers now outnumber the old-timers in the basin by a 5 or 6 to 1 margin. While there is great diversity among the newcomers, there are general themes that result in a distinct "life-style": a humanistic, low-budget, innovative, make-do approach to living, and a desire to live in harmony with the environment and themselves.

The present economic base of the basin predominantly consists of part-time jobs and welfare, with a growing edge of "cottage industry" handcrafts. The county is an area of chronic high unemployment.

The Redwood Creek project turning "waste" slash into mulch to slow soil erosion and increase the moisture-holding ability of the soil.

On November 2, I bit the bullet – the little voice inside said "It's your job to do," so I committed the next 5 years of my life to this project – to get it working as a humane, effective organization. A number of friends and neighbors got involved. What came out:

Objective: (Locally) To repair and maintain Redwood Creek lands and provide an ecologically sound economic base for the drainage basin. (In Bureaucratese: maximize the long-term productivity of the drainage basin and optimize the social and economic well-being of the basin residents.) i.e.: A combination of environmental repair and economic development. "Select your crisis."

Obstacles

1. Local Attitudes

Many complaints about the lack of concrete programs came from the local residents, yet no concerted action program or consensus on what should be done has come from local residents in the past. Past agency proposals for dams have met with apathy, lukewarm support, or outright opposition.

2. Property "Rights" and "Responsibilities"

The "property rights" ethic has still to be balanced with a "property responsibility" ethic. A major obstacle to any concerted watershed management program has been the individual landowners lack of concern for the environmental degradation occurring, a lack of suitable social incentives for change, and the fear that their property rights would be usurped. Although changes are occurring, there is still the widespread feeling among some of the larger landowners that "property rights" confer an inalienable right to do anything with or to their land, regardless of stream damage or injury to downstream users or future landowners and society at large.

3. Bureaucratic Fences

The list of agencies and legislation involved in land management and water quality seems endless. Federal agencies include the U.S. Department of Agriculture, Department of Interior, Department of Defense, and Environmental Protection Agency. State agencies include Fish and Game, Conservation, Parks and Recreation, Division of Forestry, Department of Water Resources, Public Works, and State Water Quality Control Boards, The County Planning Department, Health Department, and Board of Supervisors are involved.

Each agency, department, or bureau has its special interests and enabling legislation. The mix of interests is broad: flood control, statewide water needs, decreased erosion on grazing lands, increased timber yield, improvement of fish and wildlife habitat, fire protection, irrigation or drainage, public health, etc.

But no one agency or level of government has the legislative authority to be able to recommend or implement a holistic watershed ecosystem rehabilitation effort.

4. Current Economics

It is clear in looking at Northwestern California's resource-based economy that a future healthy economy depends on resource base maintenance now. . . . It is the interlocking forces of a society that cause the environmental deterioration:

A. An urban demand for cheap raw materials from the rural "supply depots." "General realization that the city depends on the green countryside for all of its vital resources (air, water, food) and that the country depends on the city for most of its economic resources, so that the present suicidal political confrontation between urban and rural populations can be replaced by a total political concern for the urban-rural complex as one system." (Odum)

B. An economic system that places no direct monetary value on topsoil or the consequences of a lowered water table; and often penalizes any landowner who attempts true conservation measures through tax and bank loan policies that are "growth" oriented. Resource-base maintenance is a long-term proposition, and the unborn generations to come can't vote. A certain amount of personal restraint and maturity is required to insure adequate supplies of resources for our great-great-grandchildren that we will never know.

5. Magnitude of the Problem

Perhaps the greatest obstacle to "doing something" about the economic and ecologic problems of Northwestern California is the sheer magnitude of the problem. Large land areas, diverse ownerships, difficult technical problems, and a jungle of overlapping agencies and legislation make any attempt by an individual or small group seem foolhardy, quixotic, and/or doomed from the beginning. Unfortunately, we don't have any choice. THE CITY'S "SUPPLY DEPOT" IS THE ECOTONIAN'S LIVING SPACE, AND THE PROBLEM WILL NOT GO AWAY.

Action Program

The Redwood Creek Renewal Project is designed to reflect the unique local factors of both the physical and social environment. The project is a deliberate move away from the large-scale, energy-intensive projects of the past, and is a move toward smallness, diversity, local control, and the use of appropriate technology in a labor-intensive, energy-efficient manner.

1. SCALE: The Redwood Creek drainage basin is relatively small (16,640 acres), without being tiny. The size of the basin is "manageable" – large enough to provide significant results applicable to potential future larger projects, and small enough to be studied, worked on, and followed-up in detail, with appropriate sensitivity to each unique problem encountered.

2. LOCAL SPONSORSHIP: The "bottoms up" proposal from the local community, instead of the usual "top down" state or federal agency proposal, avoids several difficulties:

A. The plan has been "pre-sold" to the residents of the basin.

B. The project has been designed by local residents to match the requirements and unique social aspects of present-day rural life in the basin:

(1) A maximum number of part-time jobs to fit with the expressed needs of local residents. Building a self-sufficient homestead requires a lot of energy and time. Full-time jobs take away time required to build up the new homesteads.

(2) A compressed salary scale to reflect the twin facts that local residents with technical skills are available to work for a lower wage than would be appropriate for a similar job in the city, and that the country life-style requires less dollars to maintain a decent standard of living.

(3) The project is to be both controlled and executed by local residents in order to maximize the economic impact of the project on basin residents, and use the technical skill and training of basin residents.

(4) Local design and execution of the project results in a greater sensitivity to the uniqueness of the basin.

3. POLITICAL UNITY: Overlapping political boundaries often prevent a holistic approach to an ecological system. This project offers the advantage of a General Plan being prepared for the watershed by the sponsoring agency (Beginnings).

4. SMALL IS BEAUTIFUL: The project has been designed with the relatively new-found understanding of the limits of our spaceship Earth kept in mind.

A. Use of appropriate technology: the project is designed to be labor-intensive and energy efficient, especially from a total energy accounting view. The capital equipment desirable for the project is limited to:

(1) One large, self-propelled shredder/grinder of substantial capacity.

(2) A small back-hoe bucket loader and small (5-yard) dump truck for assistance in bulk material handling, particularly of mulch.

(3) Citizen's Band communication equipment for coordination of work crews and for summer-time fire fighting activities.

(4) Hand tools and office equipment.

(NOTE: Ideally, the capital equipment requirements can be obtained used – possibly through inter-agency transfer. Shiny new equipment is not desired – the requirement is for used tools.)

B. The use of human-scaled appropriate technology also means the project has low capital dollar requirements. This allows a maximum amount of funding to be wage dollars.

C. Maximum reliance on the use of native materials. Retaining walls to be built of locally acquired post and board or post and pole materials, instead of cement and steel high energy and dollar costing imported material. Native plants (other than commercial conifers) to be grown in a project-sponsored inter-basin nursery. These plants will be used to replant areas inappropriate for conifers.

A portable timber saw processes "waste" hardwoods or other trees without the problems of skidding or dragging trees over hills and streams.

Action Project

The Redwood Creek Renewal Project is composed of a variety of interactive programs:

1. ADMINISTRATIVE PROGRAM. Purpose: Coordination, administration, and communication. Technical services as required. ("The office.") Prepare an Environmental Atlas for the basin.

2. STUDY. Conduct an intensive, basin-wide research study of the relationships between precipitation, streamflow, sediment yield and land use practices.

3. WATERSHED REPAIR PROGRAM. Purpose: Reduce suspended matter carried by the Creek to a definable minimum through watershed repair and revegetation.
   A. Slash clearance and mulch preparation.
   B. Preparation of problem slopes for reseeding. Includes restoration of original drainage patterns, terracing, construction of retaining walls and/or retaining mats from native materials as required.
   C. Restoration of drainage patterns to pre-logging norms as required.
   D. Restoration of old, non-permanent logging roads to grade.
   E. Initial reseeding of bare surfaces with perennial grasses.
   F. Replanting of native vegetation (shrubs, bushes, commercial timber) as appropriate.

4. STREAM CLEARANCE AND STREAMBANK EROSION. Purpose: Maximize the carrying capacity of Redwood Creek and its tributaries.
   A. Clear streams of old logging slash as appropriate
   B. Minimize streambank erosion through restoration of vegetal cover of problem slopes.
   C. Plant stream-bank, stream-side vegetation as required to restore cover and reduce water temperature. (Riparian buffer strip.)

5. POTABILITY. Purpose: Restore year-around potability of drainage basin waters.
   A. Locate point sources of contamination.
   B. Provide technical and financial assistance as required to eliminate contaminate sources.

6. SPECIAL PROGRAMS.
   A. Roads: Road maintenance work with special emphasis on adequate culverting and elimination of culvert outfall gullies.
   B. Establishment of an inter-basin nursery for propagation of native plants (other than commercial conifers) for special purpose erosion control.
   C. Fire prevention and suppression work.
   D. Study Projects: Cost/effectiveness studies and reports on the techniques and methods used on this project. Dissemination of methods applicable for use in other parts of the Eel River basin. ■

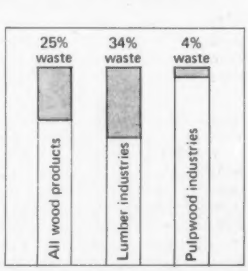
A RETURN TO PEOPLE POWERED RESOURCE PRODUCTION
(This time combining economy of design, science and labor skills)

Originally, the nature of timber extraction and production was extremely labor-intensive, from harvesting to lumber for export. Over the years multi-national corporations have consolidated most of the production of lumber and plywood into a handful of corporate ownerships. In the process they have also acquired ownership of about half of all privately owned commercial forest lands.

This consolidation and continuing application of technological developments (automation) has resulted in a diminishing need for labor at every step from standing timber to finished lumber. This is called "increasing productivity per worker" or "decreasing the number of employees" – depending on how you look at it.

Now we must begin the work of training new skills and developing diverse businesses that relate the unemployed work force to the resource base itself.

Some of these new activities are required by law to be done during or after logging: reforestation; logging slash cleanup/removal; erosion control work (i.e., water barring, check dam construction). Other activities of forest work relating to water quality, soil productivity, natural fish hatcheries and timber supply are: timber stand improvement (thinning), log jam removal, stream band stabilization, native and rye grass seeding; trail engineering, surveying, construction and maintenance; firebreak construction and maintenance; water quality monitoring; soils surveying and firefighting . . . to name a few!



Waste of wood in harvesting and milling. Data from U.S. Forest Service.

The wood products from these activities can be turned by a local skilled labor force into a series of fine quality, long-lasting products for local markets and state export trade. In the 1950's, 40-60% of two California counties' (Mendocino and Humboldt) commercial forest lands were tractor logged. Hardwoods (the "pioneer" species of oak, madrone, etc.) re-invaded. The hardwoods slowed the return of the more commercially valuable conifers. So, thousands of acres have been sprayed with chemical defoliants to reduce competition and benefit the conifers. Besides ecological damage (major fire hazard, pollution of watersheds and biosphere), the current practice of defoliation by-passes an opportunity for jobs in the following diversified, small-scale industries:

FINE QUALITY HARDWOODS: drying/curing, furniture manufacture, cabinetry, flooring (including parquet), tools and handles, toys, bowls, select flitches, etc.

CULL HARDWOODS: cord firewood, chip-"presto" logs, chips and sawdust to packing houses (for meat smoking and curing).

In addition, the utilization of byproducts of timber stand improvement, logging clean up activities and mill wastes could generate the following business activities:

SOFTWOOD MILL WASTES: soil conditioners (mixing sawdust with sewage sludge and composting), insulation (redwood bark, treated to be flame retardant), landscape mulches (redwood and fir and pine barks), poles (for teepee use as well as pole construction), combustion fuels (sawdust).

A network of forest related skills, natural resource materials, tools and markets is being developed by New Growth Forest Services and Center for Education of Manpower Resources, both based in Ukiah, Mendocino County, California.

If you're a forestland owner and looking for ecological management skills or have your own resources to offer contact The Network at PO Box 112, Ukiah, CA 95482.

Meca Wawona
Sept. 1976

Wood 'n Energy

Wood 'n Energy is a joint publication of the Society for the Protection of New Hampshire Forests and the Wood Energy Institute. The Institute has started: (1) an assessment of cordwood availability from state and federal lands; (2) research of residential size wood gasifers; making pellets from wood residues; woodlot owner attitudes towards harvesting "weed" trees and making long-term contracts from presently non-marketable wood fiber, among other projects. Wood 'n Energy contains the latest news as well as good bibliographies on firewood, wood heating and forest land management. Clearly, a small-is-beautiful approach. —PW

Wood 'n Energy

$5.00 (quarterly, at least)
from:
Wood 'n Energy
5 South State St.
Concord, NH 03301

$15.00 (annual dues)
membership in:
Wood Energy Institute
Box 1, Fiddlers Green
Waitsfield, VT 05673

With no market for the abundance of "rough and rotten" wood in New Hampshire's forests (one in three trees according to the U.S. Forest Service) removal is not economically feasible. Trees of high potential value are deprived of light, nutrients and water by these competing, low-quality trees. The lack of markets makes the long-term investment in proper management unattractive to landowners. Many are forced to sell their potentially productive woodlands for other uses (second homes, shopping plazas) when they cannot sustain the carrying costs of the land.

Protecting Creeksheds

Urban creeks are the proverbial third world of the earth's water cycle. Creeks are either ignored until man needs a place to dump his old tires and mattresses, shoved out of his way into a concrete channel, or routed into a pipe and buried under his streets. Measures which allow a creek to become an asset to the community are reviewed in a useful little publication called **Protecting Creeksheds: Analysis and Action**. *It's geared for the community person who wants to do something about a creek rapidly being engulfed by urbanization. In non-technical language it briefly reviews the concept and elements of a "creeksheds," a creeksheds's potential benefits, the impact of urbanization, and land use management strategies to protect its quality and character. There's just enough information to get something started with city hall. For further battles, its big brother publication* **Protecting Creeksheds: Development and Evaluation of a Method to Manage Small, Urbanizing Watersheds Through Local Government Actions** *(E. Wayne Say and Allan Dines, 1974; 234 pp., $7.50 from National Technical Information Service) provides more detailed information including a useful literature review. The larger publication also reviews some enlightening case studies of creekshed protection which the authors performed in the Great Lakes region.*

—Joseph Alcamo

Protecting Creeksheds: Analysis and Action
E. Wayne Say & Allan Dines
1974; 24 pp (PB 239 140)
$3.75 postpaid

from:
National Technical Information Service
U.S. Dept. of Commerce
Springfield, VA 22151

Reprint This Book!

Erosion Control Handbook
Charles Kraebel & Arthur Pillsbury
69 pp; 1934
California Forest & Range Experiment Station

Let us gather ourselves together and take a great leap backward to the days of CCC work in National Forests. This is a gem. The HOW of labor-intensive repair using native materials. (Beginnings, P.O. Box 246, Garberville, CA 95440, will xerox their xerox for $7.00. UGH!) Maybe the last good Forest Service publication.

—Gerald Myers

The Florida Experience

No state is under greater pressure from all the forces that place demands upon land, water and life. . . . The United States begins or ends in Florida.

—Raymond Dasmann

Again, water shortages become symbolic of how the "good old days" at Silver Springs are definitely kaput. Control is necessary, at least in locating new residents and jet ports. A local text in an easy academic style.

Right now, "local" problems seem to be the same all over.

—PW

The Florida Experience
(Land and Water Policy in a Growth State)
Luther J. Carter
1976; 355 pp.
$16.50 postpaid
from:
Johns Hopkins Univ. Press
Baltimore, MD 21218
or Whole Earth

The watershed: South Florida. The tools: Howard T. Odum's philosophy on energy, ecology and economics. The book: a popular synthesis, eminently practical, of Odum-in-action. If you didn't catch what he meant by "wise use of land and water," this is a way in for planners, government decision-makers, all of us. The State of Florida hasn't endorsed **South Florida**'s *recommendations. You'll be able to tell that more and more as the years pass.*

—PW
[Suggested by Don Young]

South Florida: Seeking a Balance of Man and Native
Joan Browder, Charles Littlejohn & Don Young
Free (limited supply)
Priority will be given to groups and libraries.

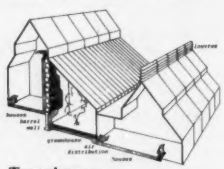
from:
South Florida Study
The Div. of State Planning
660 Apalachee Parkway
Tallahassee, FL 32304

Conserve energy by retaining as much land as possible in a self-managing condition. As a general rule, the more a development alters the natural system within which it occurs, the more problems and hidden costs eventually occur.

Housing for the Pequannock Watershed

An attempt (and all eco-planning is natal) to incorporate both ecology and microclimate in the design of large-scale housing, while preserving the watershed's primary use as Newark, New Jersey's water supply. Elementary (there's nothing on sewage treatment!) but intriguing, especially for solar-oriented architects.

—PW
[Suggested by Lisa Heschong]



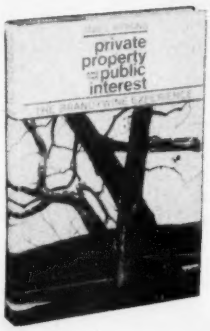
Townhouses sharing a greenhouse

Housing for the Pequannock Watershed
1976; 110 pp.
$3.00 postpaid
from:
Lab of Architecture & Planning, MIT
Cambridge, MA 02139

Private Property and the Public Interest

A plan to protect the rural character and water resources of the Brandywine watershed had one catch: it required many property owners to forfeit their ability to make speculator-type profits off future sales of their land. This is a clearly written text that escapes most of the pitfalls of academic prose. It describes the attitudes of Brandywine's people, their failure to accept a new vision, new laws and new style government needed to aid their land, water and destiny.

—PW



Private Property and the Public Interest: The Brandywine Experience
Ann L. Strong
1975; 206 pp.
$12.00 postpaid
from:
John Hopkins Univ. Press
Baltimore, MD 21218

It was soon easy to distinguish the opponents of the plan. Most of them were farmers or blue collar workers, burly and rough-spoken. Most had rural roots, if not in the Upper East Branch, then nearby. Their impotence to prevent government actions in the past had scarred and angered many of them. The plan's supporters were mostly business and professional people, quietly firm in their viewpoint and far more aware than the others of the urban pressures moving inexorably toward them. Many of them were comparative newcomers to the Upper East Branch, people who had fled the city and its suburbs in search of peace and quiet.

The basic interest of each of these groups was both identical and antithetical. Both groups wanted to protect their investment in the land, yet the meaning of protection differed. To the opponents, it meant protecting their right to make as much money as possible from the land at whatever time they might choose to sell. To the proponents, it meant preserving the present character of the countryside insofar as feasible and making a fair compromise with inevitable growth. Theirs was a rational carefully weighed endorsement. To the opponents, compromise was a dirty word: they saw themselves as continual losers at the hands of government who were now being asked to give up the chance to make the maximum return from their only capital resource. Their rejection was highly emotional; they were unable to see how development in the area would affect them and unwilling to contemplate a partnership with government to carry out the plan.

•

The Goals of the Brandywine Plan—protection of the water resources and the natural beauty of rural land while making room for development—are almost universally endorsed. The specifics—including the three-hundred-foot stream setbacks for development, the low density provisions for woods and steep slopes, and the water-related development regulations—likewise receive general support, in the Brandywine and elsewhere. The Brandywine Plan succeeded in taking one necessary step to specific land use proposals. At the next step, from land use proposals to implementation, we stumbled.

Our traditional American concept of land as a private commodity has made unacceptable to us many of the means commonly used in European countries to carry out land use plans. We believe that each owner of land in the path of development is entitled to profit from it. The real issue of the Brandywine Plan boils down to this: how much, if any, of their chance for land speculation are people willing to forego to achieve some other objective? In this, the Brandywine Plan differs not one whit from any other plan in which there is public intervention to alter the action of the marketplace.

The Town That Fought to Save Itself

Briones, like Brandywine, is "sub-rural." A town caught on the urban fringe but yearning to remain agricultural, to encourage self-sufficiency. Subdivision build-out and "bed-room" commuting to San Francisco threaten. But, through a "crisis" (the San Francisco oil spill), the town pulls together and elects a waterboard with a blend of practical savvy and visionary watershed consciousness.

Filled with eloquently honed small-town vignettes and face-to-face photos, **The Town** *is basically a journal that remains as incomplete and unresolved as America: How to decide what is "best"? How to implement the "best" even when you see it? Land. Water. More and more people.*

P.S. Orville and Ilka are my good friends. This review is a long, roundabout way of saying: I'm always in love with what my friends attempt.

—PW

The Town That Fought to Save Itself
Orville Schell
1976; 200 pp.
$6.95 postpaid
from:
Pantheon Books
455 Hahn Road
Westminster, MD
21157
or Whole Earth

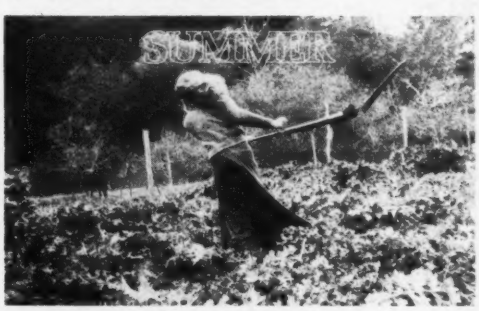
I walked the road the other day, passed the future subdivision. It was quiet, save for the wind and sound of the distant waves on the Bay. Sun, blue sky, wild flowers encroaching on the road shoulder, a few cars. Cattle watched as I walked by feeling gladness, but a gladness tinged with a fear for the perishability of the land around me. It is a feeling I have grown accustomed to.

•

The town seems to have arrived at an unannounced milestone. Whereas, in the past, almost all our collective energy was directed *against* something, toward *stopping* some outrage or other, now finally it seems to be directed *toward* building.

Only one major effort *against* something comes immediately to mind. That is the fight against Rolf's lodge and condominiums. We have spent so many dreary days with the Planning Commission, the supervisors, state agencies, officials, and so on, wrangling endlessly. We have fought sewers, road widenings, oil spills, marinas, restaurants, subdivisions, building codes. Much of that frenzy seems to have ebbed. We We have gotten stronger and wiser.

The tourist cars still arrive in ever-increasing numbers. We still go over-the-hill to work, escape, shop. Land prices and speculation continue to threaten. But the town is brimming with activity directed inward toward itself rather than outward against various out-of-town menaces.



That Which Makes You Move

A Conversation with Taj Mahal

by Lewis MacAdams, photographs by Ilka Hartmann

When Bob Marley and the Wailers sing in Rastaman Vibration *– "Positive vibration, you got to have a good vibe," they could be elucidating the philosophy that informs the music of Taj Mahal. Ever since his first record on Columbia,* **Taj Mahal** *(up to now all of his records have been on Columbia, but he just signed with Warner Brothers), Taj has been a force for positive, human (as opposed to robot/disco) music in this hemisphere. At a time when most Americans, black and white, had forgotten the black, rural roots of rock and roll, Taj Mahal was nearly the only young black singer investigating the truth of the country blues, and singing the old songs into the present, where all of us could move and be moved.*

In the last few years, on albums like **Mo' Roots** *and* **Music Keeps Me Together**, *Taj Mahal has immersed himself in the incredibly rich tradition of afro-caribbean music. Taj Mahal's music and person are like a confluence of diverse and vast rivers. His music is about inclusion. He is one of the very few performers who can get an audience singing together without making them feel that they are being dipped in candy. By investing new energy in the old musics he strengthens the present as it flows – which is the glory of the love and confidence and positive vibration in his music, which must grow from the love and confidence and positive vibration in his life.*

–Lewis MacAdams

Taj Mahal: I was basically raised up in the city, and I kind of say "up south" rather than "down south" because a lot of people get confused. They think by the way I play that I must have been raised "down south." Well, I was raised "up south." I was born in New York and raised up in a little town called Springfield, Massachusetts. Terrible town. It was basically set up by a kind of a labor thing. I think originally it was western European peasants who came there, and they put them up in these little tenements, and they worked for the factory, bought their stuff through the factory. Eventually, when they kind of got up, the next ones were moving in behind them. Finally, when that bunch got through there, then the blacks would start to move in. The Jews were first, and then the Italians, and then the blacks would come in, then the neighborhoods were mixed up with probably 70 - 90% black, and then all other extractions. Other neighborhoods were like 80 - 90% all-white, and then a few blacks who had the money to get into the neighborhood.

So it was really an incredible cross-section, plus it was in the center of a bunch of colleges. We had American International College in the center of the town, Springfield College at the edge of the town, New England School for Business right around there. We had Mount Holyoke over the other side, Amherst College, such-and-such a school for girls, such-and-such a school for boys, all that. So there was all kinds of room. If your lights were on upstairs you could get going and do something if you had some smarts.

My mother's people are from South Carolina and they're probably mostly black and American Indian – Native American extraction, and whatever else; and my father's people are from down in the West Indies, from an island called St. Kitts. They came here around the turn of the century. They're African-descended people.

So independence is something I've been blessed with and cursed with at the same time. Because a lot of times I didn't know I was that independent, and it made it real difficult to work with a lot of people who were just not used to you just going when you got to. You know, they were used to waiting around, but I was used to smokin right along.

I came up with a lot of music and a lot of philosophy. My father was not an institutionally educated person, but my mother was. And that gave me a kind of balance between institution and common sense. I kind of grew up listening to jazz and gospel and classical and pop and everything. I was into all kinds of music. We were allowed all kinds of music to listen to in the house. A lot different than a lot of other people. Plus my father being a musician, a piano player, he liked standards and jazz and ballads and big band blues and stuff like that, so we got a chance to hear all kinds of music. So my music was not just pop music on the radio. Everybody came to school bringing records by Elvis Presley and the Five Saints and I came in with "The Flight of the Bumblebee," or "I Can't Get Started," something of that nature. I mean I was that far out because I thought it was all music, but I didn't realize that they got limited by what they heard.

Lewis MacAdams: Did you go to church?

Taj: Well, you know, that was a very interesting situation. My mother was raised Baptist and my father was just "non-religious" I could say. I don't know whether he was agnostic or an atheist. He didn't particularly care too much for church or organized religion whatsoever. But he didn't discourage us from goin. We went, so I went to a lot of different types of churches. Especially if I had a little girl friend here and I could sing in the choir and stand next to her. I did those kind of things. I liked singing in the choir, and I had such a big voice at the time, as a youngster from 10 or 11, that they just let me sing. They didn't even bother me. I sang all over the choir, harmonizing anywhere, just opened it up – gone.

But by the time I was 13 years old it was just not happening for me, you know, organized religion. I pretty much organized myself to say that if I did find a type of religious people that I felt merited some attention I would pay much more attention to them, and it wasn't til about the late sixties that I did start running into them. The people I was introduced to by my father was people like Gandhi.

Gandhi's primarily the one who's influenced me. I never realized how much influence he had on me until I got older. I came into the sixties talkin about changing my name to Taj Mahal – in about '59 that came down – it never occurred to me that the connection had been made years ago through the type of relationships that we had in our house. We weren't rich people. I'd say we were struggling, you know, clothes on your back, roof over your head, food in your mouth. You could go to school, read and count.

When Lewis MacAdams left our town's local water board to teach poetry in the schools of West Virginia, I replaced him as a board director. I realized then that he had been the "heart" spokesman, the guy on the water board that told it right-on and with soul. Right now, he is proclaiming his poetry before a twenty-four foot owl built by Steve Davis. He is also Director of the San Francisco State Poetry Center (latest book is **News From Niman Farm***; from Serendipity Books, 1790 Shattuck Ave., Berkeley, CA 94709 or Whole Earth; $2.50). A strong voice. –PW*

But on the philosophy side my father was pretty heavy, and instilled us with the ability to be, as I say, independent and free thinking men. Gandhi and people like that I didn't start to really read up til I became well up in the late 20's. (I'm 34 now, I'll be 35 on my next birthday).

I was already in my late 20's before I really came down enough off of being jammed. Got about all the sugar out of my diet. I changed off of sugar and meat after I had an illness back about eight years ago, and that really calmed me down, that brought me down out of the sky. I was flying. Coffee, sugar, meat – meat, coffee, sugar.

But to give you a background on how I got started in agriculture. I was in the city and I talked to my parents about different things (incidentally, my father was killed when I was about 11 or 12 years old, so that was a very traumatic difference in my life, because he was like the spirit that led me to that point, and after that I didn't see anybody to go by). So I just sort of picked up on what he had left me and looked around for people that had something good to offer. I met some people, but not an awful lot of them.

LM: How come you changed your name to Taj Mahal?

Taj: That all came down in a dream one night. That was what I was supposed to do, and I was supposed to play music for the rest of my life. I was supposed to correct the misinterpretations of the music. This was all in a dream. It has to do with the different seasons of the year, because I lived in New England for about 25 years. It seemed like every year about along in the Fall everything would die – and your vibe would sort of die with it – and you'd get sort of bundled up for the winter – get ready to go through the winter – and then spring would come and you'd scream out and it's three and a half months of pure pleasure. But you couldn't get too far out, because you know wintertime was comin. All of that got connected to it somehow. I guess that went down the year before I went to the University of Massachusetts. The main thing was that I recognized that people were unhappy. The general state of the United States and the world was very unhappy and a lot of it was because the machinery that had been used had created a problem and that there were no alternatives. And I figured that I'd have to have some kind of outrageous name to get the kind of attention that I thought I deserved, and then the name came to me in a dream. Man, at first I must have had about seventeen different ways to spell Taj Mahal. All kinds of ways because I was trying not to spell it just like the Taj Mahal because originally it was spelled Majhal – so it would sound like it – but people would not put that "j" in there, no matter what.

Anyway, as a youngster, as far back as 5 or 6 years old I was thinking about what I wanted to do. Did I want to be a fireman? No. I liked that idea that they'd go round in big red fire trucks and wore blue suits, and weren't cops. They were nicer than cops. Did I want to be a policeman? No, definitely not. Did I want to go into the army? No, huh uh, I wasn't interested in killing people. If I did I'd be either in the band or be a cook. I had it all planned. But I used to try to talk to my parents, primarily my mother, about the South. But she was pushing the South behind her. She didn't want anything from it, and she didn't ever want her kids to know anything about it. And you know how kids are. You become very inquisitive when they say, "No, no, don't worry about this. It's all just work and filth," and all that stuff. So I became extremely interested.

And I also became extremely interested in the fact that if you eat food, you got to grow it. And if you don't know how it's being grown there's a big wide gap in what you know about what's happening. And I didn't understand why a lot of people resented the farm so much. So I thought, maybe it's something that I'm not seeing, because I looked at farm

life as something really nice. The father's home all the time. The mother's home all the time. The kids are home until they go to school, and they come back and there's fresh air and sunshine, water – and they run around, ride horses, and get crazy in the hay loft. Help out and have responsibilities around the farm.

So little bit by little bit I got going and decided I wanted to be a farmer, and boy, what did I say that to my parents for? They didn't want me to touch the music, so I went through a few changes with them on that subject. Then I said, "Gee, nobody would argue with me if I was a farmer. What a nice thing!" And of course my parents said, "The boy is crazy! Farmer! OH my god! I didn't raise my boy to be a farmer!" But I thought to myself, "My god, if you don't know where your food comes from, where your feces go, you're in a bad position. You're like a rat in a cage." So we talked about it, and I said I was interested in farming. Had I known, I'd a probably have started out a lot earlier, as a youngster and I would have probably gotten into 4-H. As it did, it was about the eighth grade when the big confrontation finally came down and I told them that was what I was going to do. My mother had remarried by this time, and she said, "Well, if you're still really interested, at the end of this year, if you've still got the hots for it, we'll see that you get to go to school in the next town." Because they didn't have agriculture at the school in my town. They had a trade school in the town basically to keep all the black people and the slower whites and chicanos and Puerto Ricans and people like that into the trades – so that they could control them later on. Well, I just said, no, that wasn't going to happen to me. I wasn't going to be a grease monkey, not that I minded working like that, but I wasn't just going to be just a grease monkey. So I went and got myself into this school at West Springfield. Then that lasted a year, cause we had so much room and a big shop. And man, I'd come to school in overalls, and we'd get to pounding and nailin and sawin and goin to farms. I couldn't believe it was possible. This was going to school! I could do this all day and then have my college preparatory in the afternoon, because I found out that it was only two or three courses, and you could spread them out during the week. So I'd swing out, get to school early, you know, and I started going and found that in the same area that everybody was dozin in, man, there was so much stuff going on. Woooo!

So I got busy, and I learned carpentry and mechanics and electrician and stone masonry, and how to fix wells, dig wells, fix cows, everything. I just couldn't imagine there was so much to be learned. And it was extremely challenging for me at the time. Kept me out of trouble, kept me busy. It didn't give me a whole lot of friends, but it kept me busy. And I decided at that point that I wanted to be a farmer, and maybe play a little music on the side eventually. This was at my 12, 13, years old stage. When I was 14 and 15, I picked tobacco both of those years to get myself into it, and by 16, I got hired on by a guy out in South Hadley, Massachusetts, and I helped him cut corn and worked during the winter on my weekends. And the next spring I got hired on by a friend of his, the two of them had gone to the agriculture school together and now had their respective farms; and they had heard about me through a couple of other guys that worked around there, and they said I was very responsible. They said I talked a lot, but I worked great; and asked a lot of questions. So I worked for them and worked for this guy Herman Landrieu in Palmer, Mass., and I started out just to work there one year, and ended up workin there about eight. I just liked it. The family was real nice. It was a French-Canadian and English family, and they were very nice to me and as a matter of fact they really took me into their family. I worked for them about three years, sort of like a greenhorn growin, and then for the last few years I was like their foreman, and ran the place. We had a lot of cows. We had Holsteins and Guernseys and some Angus cross cows, and a couple of other different types of cows. But mostly it was a Holstein herd. We had chickens and tractors and corn silos and green feed. I couldn't believe it, man! There I was, seventeen miles from home and in the country. I had everything.

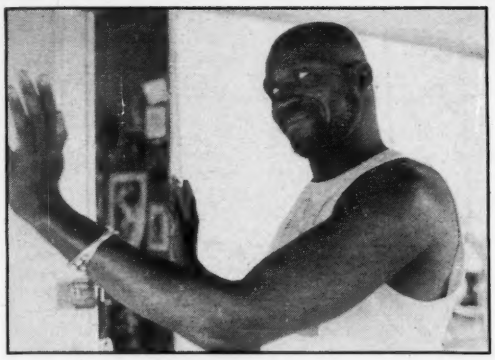
So I worked for them, and I really didn't do too much music during that time. I had a guitar around, and they had a piano up there and an old pump organ. Every now and then I'd get some time in between my chores and work to play some music. The only thing I took with me there from the city was my guitar and the radio. But what was interesting was that workin on the farm there with all this space the radio from the city had nothin to do with what was goin on out there. The radio from the city was just not enough energy. It was like totally clunk, it was fed for you to be ridin in your car, ridin around the block, with nothin on your mind but the radio. I said, wow, if people listen to this stuff for a long time, they're going to be insane. The only people that came through the radio, I think, that I really liked was Dee Clark, Jackie Wilson sometimes, Marvin Gaye. The first record I heard by him was "Stubborn Kind of Fella." I heard other records – "Sleepwalk" by Santo and Johnny used to come through there, and then late at night I'd hear things . . .

But, anyway I had it set up so that when I went into the barn, man, the first click of the switch the radio was on. I used to play the music while I milked. The cows liked the fact that I played music. They really liked my vibe, as opposed to even the guy that ran the farm, cause when he'd come out they'd hold their milk back, and he'd be in there workin with them a long time. But me, I'd got into the cows so, that I'd just flip the switch.

Most of all, I got a chance to work and use my body when I was young, build myself up, eat good and get plenty of fresh air and water. I wasn't a smoker or coffee drinker. Later on those things came, as I went to college and got around more people socially.

The guy that I'd farmed for, he paid me, I think, somewhere around $120 a month, thirty dollars a week plus room and board, and medical. So I saved me some bread and paid my tuition for two semesters at the University of Massachusetts, which was originally an agricultural school, called Stockbridge School of Agriculture, and then it built into the University. Once they got state funded, all the other guys moved in with their liberal arts, that grew bigger than the agriculture college, and they kind of pushed the agriculture off to the

Taj Mahal's wife, Inshirah Mähäl



side. But they had great acreage, etc., and a great herd of cows, and all that kind of stuff.

For me the hang up came with music, because I had no music to go on. The only music I had to learn was on the jukebox and the record player. Shit, I didn't know how to play the guitar real good, I could play like somebody who already played, but I didn't have no style of my own, and that really bothered me, because you can't really go somewhere and just not have something to offer. You can't just come in and say, "well, ok, if I had my record player here I could play you the Beatles." You can't do that.

But I became very interested in ecology and the fact that they just kept dumpin more in the rivers and dumpin more in the ocean. I said, "Wow, that doesn't sound intelligent to me. My intelligence tells me that you can do this. And these guys were tellin me I'm not intelligent, because I'm a black man, that in my genetic make-up I'm definitely behind. And I just got confused. I said, "What the hell is going on here?" So, anyway, I said, "These people got their heads in a bucket, forget about them, go ahead and do whatever you're doin," but the ecology thing kind of laid low, because I couldn't find any more information, and it didn't get sparked again until the hippies started.

LM: You weren't hearing the word ecology when you were in college?

Taj: No, but I will tell you a word I was into which was synergy. I've known that word since about 1959. And what it has to do with is that if, well, in a rotation, you grow corn for one year and you grow alfalfa for three or four years. Because alfalfa's got that nitrogen fixin bacteria, which is an excellent example of synergy: cow peas, field peas, soy beans, lespidiza, bird's foot trefoil, red top clover, all your clovers, put that nitrogen back into the soil. So then, every four years you can run the corn in there for a year, without it draining the soil. Well, that's the process of synergy. Takin one or takin two and four and getting 68. That was something they talked about very heavily. So the concept was in my mind, and I figured it out and we used it. We grew an awful lot of alfalfa for our cows and had pretty good rotation.

I got a chance to do a lot of stuff that most kids, let alone black kids, don't get a chance to do. Down south, you might have a little more, or maybe in the Midwest or Southwest if you're interested in agriculture. But up North they don't dig. They're pretty much city oriented, if they're not hooligans or hoodlums, they're intellectual bums of sorts. It's really hard for 'em. Or they go the other way, they get so totally bourgeois there's nothin available to communicate with them. So I was out there and I considered myself pretty lucky. Kind of lonely, but – this problem – synergy, that's something that travelled with me all these years. Every year at some point that would pop up in my head. I'd think about that concept, think about how marvelous it was, man, and if I ever got myself in that position, I'd be working on that one.

LM: The kind of animal husbandry you were studying at college, that kind of the basic theories of agricultural college, were you seeing that you and they were going a different way?

Taj: Some of it was. See, I didn't realize how much of a thorn in people's sides I was, because I'd be askin questions like, "Well, gee, is there any possibility of not havin to use that chemical fertilizer?" "Wellllll – no, no, of course not!" "Wait a minute, you just said over here that X number of tons of manure is created by each animal. If you've got 175 animals in the barn you got X number tons of manure. Now, supposingly it's some sort of situation." "Well, it costs too much money – blah blah blah." See, at the time I didn't realize the chain – I didn't realize that the fertilizer company was putting money into the University to tell the farmers . . . heh heh – I didn't see it at the time and just was lookin' straight ahead, you know. But since the farm didn't have University money, we hit somewhere right about in the middle, you know. Got a nice balance. So I had a chance to do a little O.J.T. – on the job training – while I was going to school, and set up a really good balance. And eventually I thought I might go to Africa, or to South America or the West Indies, or Mexico, or someplace like that and take the information and reduce it for the type of trip that was happening there. So you wouldn't hassle the people, or throw them outa whack with nature. And you know I got a better understanding of the nature of things and how it was growing, and how things grew.

But when it came time to decide if I was gonna go into my own farm I started figurin what I had and what it took to start a farm and it just got to be so much money to raise and you'd start down here with zero and by the time 25 years rolled by you might have the mortgage paid. That just didn't sound too hot to me so I said, "Well, maybe I should try to make some money and get myself a farm later. What's the next thing you got to do?" And I said, "Music." So I said, "Well, you haven't been playing all these years, you've been farmin. Well, you better get busy." So I got busy, and kept on stepping. And I found out that college was nothing. It was so easy that I had a band on the weekends, travelling all over New England every weekend, and playing every Thursday night at the Mixer. I was keepin my grade up, I learning to play guitar, and I made the acquaintance of some really nice people. Buffy St. Marie was one of the persons, and she had an awful lot to do with getting me involved with the folk music thing. Because I didn't know that blues and all that stuff was folk music. I mean, when it comes from you, it's just a part of you. You don't see it as a part of American tradition or something like that.

But anyway, I got what is called an Associate's degree in Animal Husbandry, and I minored in Veterinary Medicine and agronomy, which is soil science. I had learned what I needed, and I got my guitar, and I split to Boston. I got an apartment there, hung around, and started playing in clubs. I'd been playing the guitar, and had a band, and I'd been working at it since I was ten years old, but I hadn't gotten very far, because there was always something to take me off of it. But now I had time, and I started getting pretty good at it. At least good enough to hold a job, and play in a couple of coffee houses, and have some pretty authentic sounding songs.

After I lived in the Boston area for a while I went to New York and Canada and Detroit. And '65 came along and I hooked up with a guy named Jessie Lee Kincaid and, wheeoo, out to the west coast, that was it, from there we

started moving with a band called Rising Suns. That's how music brings us up to date, 'cause when I got here, that's what I was doing, music, and hanging out. Then I moved out to Santa Monica for a while, and went right back to having myself a garden and dogs and everything, and got kinda set up there and taught guitar, you know, to make money. And I learned how to fish so that I could keep my overhead down. That's when I really started getting interested in what was happening with the hippies. Because — during the time I was in school I started noticing this element of young European-Americans who were not at all into what you would have expected them to be, from where they came from. They was like an incredible thing happening. And I didn't understand what was going on because I thought "Well, you, you got everything. What the hell you doing that for?" Cause we're told that the white people got everything. And here's these white people, they coming along real freaky. And I'm saying, "What is going on? These cats is crazy." And the chicks were not wearing makeup, and tying their hair up in bandanas, and wearing lots of blue. Blue was happenin, man!

See, I'd been doing that on the farm all the time. I'd been wearing Levi's for a long time, cause I was just hard on clothes. That was why I wore them. Couldn't be stylish, because I would just rip up whatever they had. So I found myself, just by naturally being involved in the agriculture, totally aligned with their movement. And I didn't understand how I was there. I didn't make no commitment to it, but I tried reading the poetry of Jack Kerouac and getting involved with "beat sessions" and all that stuff there.

LM: What Kerouac book did you get turned on to?

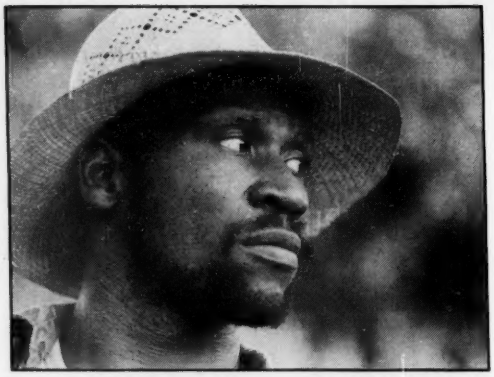
Taj: **On the Road**. Yeah. Oh yeah. That blew my mind. Coupled with the music and the fact that it was a place to go where people didn't hassle who you were and looked upon you by what you put out, that really made it real nice. The hippie thing started and this kind of blew my mind, I didn't know what was going on here. I said, "These cats are going to finally make it. Look at this!" So I checked it out, and checked it out, and I used to hang out in this little head shop, and I couldn't believe the business he was doing. Everybody was coming in for everything. He had all the latest records and I brought him down a tape of my first record at the time. I started reading the San Francisco **Oracle**, and boy, I couldn't believe, I mean, "You mean they print this in a magazine? I'll buy it."

And I'm reading and reading and reading. And I started getting gigs around and I saw more people getting involved with the alternatives, more and more hearing about the people trying to move off to the country and having direct problems. And most of the problems were because they were raised up with city ego, and they didn't realize, you gotta can that stuff on the farm.

LM: What do you mean, city ego?

Taj: Well, you sit up and watch TV. You ask your old lady to bring you a beer. On the farm, you're gonna reach for your own. Or, when the boss's wife comes out and brings beer for everybody, the boss gets fed first. You guys that are helpers, you get fed second, and you ain't nothin. That's just the way it goes. You don't hassle nobody, because there ain't nothing to hassle about, you got work to do. And when the work's done, there's more work to do. And in the city, people are hanging out, looking for something to do. I was not looking for anything to do.

But anyway, when I got out here, and I started seeing articles and really noticing that the consciousness had changed from what I'd known Americans to be when I'd come up. And then, I tell you, the thing that clenched it was the **Whole Earth Catalog**. Boy, that was like somebody



came along with Windex, you know. And, OK, To the Cosmos! Here we go! Once that came along, that was it for me, because I realized that somebody was seriously working. I thought the **Whole Earth Catalog** was such a work of art. Because I used to sit around and say, "I wish they had time to put together a magazine like that." And here it came. It's almost as though somebody heard you talking, you know. And . . .

LM: But how's that tie in with your personal life? You were obviously at that time just moving further and further into music, out on the road.

Taj: Yeah, but I was thinking that eventually I wanted to get the hell off the road and have myself a farm. So I was collecting tools and information at the same time — got ripped off for all my tools by a weird bunch of junkies. I used to give the **Whole Earth Catalog** as Christmas presents. I'd send it to people, and they'd say, "What the hell is this?" I'd say, "You look through it for a while." And then they'd call you back six months later and say, "Hey, man, you know what?"

And I got involved in yoga and did that for about two years, and then I got sick and changed my diet, also, around the last part of the '60's and stopped eating meat, and was a vegetarian for about four years, a very strict vegetarian, and then got my body I felt, balanced and cleaned out. And then re-started it again, eating things, and now I eat fish and chicken on occasion.

LM: What about Black nationalism? Where were you when that was coming down?

Taj: Oh, I was so far ahead of that shit. We were just ahead of them. My uncle — my eldest uncle — is a Muslim. He's a serious Suni Muslim, and he hipped me to a lot of stuff that was going on. Our examples of people were people like Marcus Garvey, Mahatma Gandhi, so I had something that I was working with. To me the black nationalists weren't universal enough, because they had really learned Western. You see? They made no room for the East. So when they saw someone from the East, immediately they still bagged them, so ultimately you had a white racist and a black racist.

LM: How about the Civil Rights Movement. Did you ever. . .

Taj: Oh, I marched. I mean, I put my time in whenever I saw the cause being right. When I saw that it was going to get from A to B. But when I was up against the elephant with a toothpick, forget it. Pygmies know better. You know what I mean? I figured that if you couldn't learn from your people on that level, you weren't too smart. I was lucky, in the sense that my father had grown up in New York in a time when there were lots of immigrants from Europe and was very well versed in speaking different languages. So I didn't have no problem relating to European-Americans in

Though you played at love and lost,
the sorrows have turned your heart to frost,
I will melt your heart again.

Remember the feeling as a child
when you woke up and morning smiled,
it's time you felt like that again.

There is no percentage in remembering the past.
It's time you learned to live again and love at last.
Come with me, leave your yesterdays,
your yesterdays behind.
And take a giant step outside your mind.

– Taj Mahal, Giant Step

the sense that I wasn't afraid of them. A lot of times they were afraid of me. And I didn't even know at times what that was all about. Oh they were weird, or they were prejudiced, or they were racist. Whatever it was, I thought it was too bad for them cause I was really a nice person. At least I had that much going for me, and I didn't get behind. So, but at the same time I saw that Black people were totally just being surrounded by the machine, and the new environment, and that they didn't know – just basically – how to come out of the dark. I was lucky to have a father who had given me something so I could still stay right where I was and see through stuff. I mean, like I'd be on a corner and a cop would come to hassle me and I'd let him know, kindly, that he was talking to somebody that was awake. That he was not going to pull out his billy club and bludgeon me to the ground, cause I would take his number. See? First of all, I knew my rights. See? Like we were taught to know a little more about it then, than fear, or "don't get into no trouble."

But I was troubled by the whole civil rights thing. I supported Eldridge Cleaver wholeheartedly, because of what he had to say, and after reading his book, I thought he was seriously the spokesman of the '60's. He talked about some fine things, and some of the other ones I didn't particularly care for, because I felt that they were being led, by virtue of the type of arguments that they made whenever there was a showdown.

I was intelligent enough, again, to read when somebody was being duped, or somebody was saying what was coming from their own heart, and intelligent enough to say it. But I was really kind of upset about a lot of stuff about that time, cause I kept thinking that maybe I wasn't putting my commitment in. But I said to myself, "Man, nobody's taking care of the music." So I said, "that's what I'm doing. I'm taking care of the music and I'm dealing with the agriculture, so that at the end of this, whatever comes around, somebody says 'OK, now what do we do to put this together?' I'm gonna say, 'OK, here it is. Lay it down. Anytime. It has to be laid down." So I says, "Here are fifteen of us. We want to move to the country. We got 800 acres. Do you know how to get it together? All right. Let me see the land." I want to see the lay of the land with the drainage. I can help them out in that way. Yeah, anytime, no problem.

Anybody, too. That's one of the things I've been working on. See all the time I've been going along, I've been keeping my books, keeping myself up to date. I'm a little bit behind now. But, if you threw me back on the tractor, I'd know where the shifts were and where the levers were, and we'd be working. I mean, I'd work that day. You know that kind of thing.

And I felt that's what nobody was paying attention to. I mean, after all this war and fighting was over, where you gonna get your food from? You gonna go to the supermarket? You're outlawed and you're goin into the supermarket? I mean, it just didn't make sense. But the radicals were young. They were from inside the city. They'd read books, and books told them this.

Plus, also, too, I had been involved in interracial relations. I have children from interracial marriages. And I was just a lot more freer about what I was doing with my life at the time. I was confused about a lot of things. I just didn't understand all the constant pressure. So, what had to happen, was people had to come to the gun, and then they had to realize finally, that the gun was not the way.

But I kept right abreast with it, with the Panthers, with Eldridge Cleaver, with US, with CORE, SCLC, I worked with the activists. Activists have stayed in my house. It was known full well that when you came to California, you could stop here, get a meal, stay overnight. Many times you came in the house, there was bodies from the living room to the bedroom, you know. Everybody was all over the floor. And then they'd hike out in a couple of VW vans the next day. I just put myself in where I felt I was able to do it and still work on the music. Cause I felt if I got off on another trip, and when it all came through, the music would be over here and the people would be over there, and there would be no communication. So I stayed over here and worked in the music, and kept up with it. And really finally came around to actually hear these guys say the very words that I thought was going wrong with their trip at the time.

The next era that came down was that I played an awful lot for the European-American kids, cause they're the ones that were into the Blues and very few Black kids. And then as time has gotten on, more Black people have gotten interested in my music and more younger Black people got interested. Older Black people have always liked it, because they're a little slower and a little more in tune with it. And also too, I've realized that playing a monk's role in music, which is being in the monastery and talking about how beautiful it is here in the monastery while everybody is fighting and killing each other in the city, is not really what it's all about. You got to take that monastery to the city or figure it out someway. That's what I kind of like about the Zen Buddhists around here.

What I'm doing right now is I'm checking out the idea of a 47 or 48 foot trimaran, and putting a living capacity on it. Then I'll be able to travel. I'm checking out having a van for landcruising, having something for ocean cruising, so you can move around some. And then not have a house. Or have a teepee and land, I mean I'm just gonna get it right to the crack, between the house, and actual wilderness living. So that you can move your house with you. The whole object is being able to move your house.

LM: A nomad.

Taj: Yeah. To a certain degree. Or maybe have a house at some point that would be of simple construction. So that you could be able to hole up for a while. But to me a teepee is just as great as a house. I got a friend that's been living in one for ten years. He and his wife, dog, and two kids.

LM: Well, I feel like one of the biggest dichotomies in people's minds is the question of nomad versus settling into the land.

Taj: I know. I know. I'm right in between the two of 'em. But at the same time I love the sea, and I have relatives down in the West Indies, and all the way down into Venezuela, and probably over into Panama, because they took a lot of people from over there to build the canal. And I speak Spanish, speak French, a little bit of German, speak various dialects of English, and I got the hots to travel. What'd be hot for me is to build myself a trimaran and sail

down and see Marlon Brando, because I wanta see what he's doing. I've always respected him. If I was in the same position I'd be doing the same thing.

LM: What animal do you most relate to?

Taj: The Bull! Horses, bulls. I like dogs. I really like all animals. I like to find out what it is that you can work out with them, so you can work around having a good time together.

LM: How about wild animals?

Taj: Like what?

LM: Like animals that might come to you in dreams, or at different times, animals that might bring signs.

Taj: There probably is, but at the moment it escapes me just what it would be. No, I'd say the bull.

LM: You're a Taurus, right?

Taj: Yeah, the bull's a heavy symbol in my life. Because you see, in the East little children lead whole herds of bulls, whole herds of buffalo. You're three years old in China, and you better be able to handle it. You get a stick, and you better be ready to work the bulls. In the West, they put a ring inside the bull's nose, because they don't deal with the animal on the basis of what the culture's all about. They're like "O.K. You son-of-a-bitch. Here you go. Crash-Crash. I'll put you in here, and let you out every now and then." We're always forever locking the bull in. And that always fascinates me. Because I've had a lot of animals, a lot of big animals, and I didn't have any trouble with them. Because I found out where their vibe was, and worked with them and considered the bulls part of the whole trip. Because we're dependent upon them.

LM: Peter Warshall, who's editing this issue of the CQ, asked me to ask you this question. Do you know where your water comes from, and where it goes?

Taj: Oh, yeah. I really do. That's exactly what I'm into. Up until a few months ago we were buying the water. And sometimes we still do. Buy it in big jugs. And we double on using the bathroom, double on using showers. Just like I'm out there in the rain with my buckets now, which reminds me . . . *[gets up and goes outside to adjust buckets toward the flow of rain water]*. If I really had it organized I'd have a big cistern down there in the ground. I saw that when I was over in Spain, and that's how they do that, that's how they get their water. And it's filtered down to the bottom and you'd have real sweet water, nice 'n cool. Not cold, but cool. Yeah, I'm very well aware of where the water comes from.

LM: Could you talk any more about this nomad/domestic crack?

Taj: It's a hard one.

LM: Because America is so unrooted. Sometimes I have an image of this nation dancing on its tiptoes trying to stay off the ground.

Taj: Yeah, I understand you. That's unfortunate, but that's the way it is.

LM: Why do you think everybody left the land?

Taj: Too much drudgery. I mean shit man, I'd have had a hard time being a farmer in the old days. Because see man, I'm too independent. I'm the type of person, I don't care how long it takes me, I'm gonna get there. Because most people don't have no perseverance. That's what they've gotten through their machinery. The televisions, the radios, the records, the advertisements, have totally turned you off from yourself, so you be thinkin you decided something, but you ain't decidin shit. I mean it's all possible. You just have to get in there and do something. And it ain't about just sittin here on your ass. But I think basically California' got the better chance of almost all the states of the union to really work something new out, because at the top of the state there's somebody with some intelligence and spirituality, which is necessary. You have to have some spirituality or your life is of no value. Ultimately, my belief is that the West is now approaching its first actual birth. Not re-birth, but birth. And it's not just somethin where you can just walk into a church and say "kmuhhoholyumdohummylumyla" and you've got it. It takes work! And people are not used to that in this country. They thought that the ultimate thing was to be able to do nothing. And that's bullshit! We got all these people driven to the madhouse because of that.

LM: I had this experience, where I was down in Riverside on election day giving a poetry reading, and I took a bus into Los Angeles from Riverside that day, and looking around, all the eucalyptus trees were withered the air was so bad. And all the people were bent over, and the sky was full of traffic helicopters. And all those people voted three to one in favor of more nuclear power, and I just kept thinking, are we all still in the same race?

Taj; But see, Advertising tells them that they can sit home, and have all this power without having to do anything, and that's the big sales point, that's the sales pitch.

LM: Do you think you can sing about that?

Taj: Well, I've thought about it, and I'm coming up to something. I think it's gotta be vocal and visual. And it's gotta be danced, and it's gotta be felt, and it can be read. We have such a dispersal of the artists. The artists are really what keep everybody together. The dancers are over here, the musicians are over there, the poets are over there, the painters are over here. The visionaries? Well, we get one every now and then. Dylan started telling everybody what to do, and then a lot of people got out and did things behind it. But there's so many slow people at the top. I mean they're traveling around on a star that died a long time ago. All that's gonna be settled when the big ship comes down, the big ship from the sky comes down.

LM: Do you really believe there's a big ship from the sky?

Taj: Man, it is in the air! At one time there were large, giant animals wandering around here, and in a matter of seconds, it was changed. In order for a mastodon to be stopped with the herbiage in his mouth and in his stomach totally intact as to what it was, let me tell you, that was a matter of seconds!

LM: What do you think it was?

Taj: Man, who knows? In terms of the power, all I can say is Jah. J-A-H. That's all I can say.

LM: I think that idea came out of acid. I think on acid everybody saw the millions of apocalypses, and they saw that everything was so bad, and they got this wish that the only thing that could change it was BLOOW. "The ships" is like an apocalypse wish.

Taj: Well, this earth is constantly changing, and we don't know everything. All I know is that originally my people came from over there in Africa, and they had a lot of stuff going for 'em. Now, if I look through the Western Mind that I was taught to observe myself with, I would say that the African people are primitive. But when I cast all that off, years ago, and started observing that maybe they once had all those cities, and they went to what they were because they realized it wasn't shit to have all that city and all that insanity. Because you remember, all their great empires are behind them, and they were living in harmony with the earth when they were taken from there to this

country. If there's any possibility of the earth getting into balance I'd say that Africa has the biggest opportunity. I think that Africa is going to be the place of the future, and Americans should really begin to get themselves in tune with that which made them move — Afro-American music.

And that point is where it changes from being something I can talk to you about, to being something that spiritually happens to me when I move from this realm, into the realm of dealing with my ancestors, which is something I allow. Which most people in this country don't allow. I tell you, the West needs to work it out, man. They need to work their karma out. They never work their karma out. They let somebody take their karma for 'em. "Here, you take responsibility." Or "Here, talk to my insurance company." There's no direct confrontation. And until that comes about . . . and what happened to Rome? They got so berserk, they were barfing up their food after they ate it. And you see a semblance of the same thing now, because we've taken on the trapping of those roman social orders as if that was the only way to go. You've got to find out the roots of the education you're getting, and where it's coming from. It's very important to find out that ultimately that the people you're studying from only respect what went down in Rome. There's other things out there. The Balinese say, "We have no art. We do everything the best way we know how." When I heard that I about flipped out. It's true! I don't know what to say. All I know is, whatever I leave behind me is going to be useable by somebody, or is gonna decompose in such a way that it's gonna become fertilizer.

LM: Do you feel like you're a spokesman for anything?

Taj: Maybe for certain types of ideas, but the main thing is, man, I feel you've gotta connect up with the energy. There's a lot of energy out there. Not being of any organized religion, I find that there's an incredible amount of energy for a man or a woman, if they're interested. There's a lot of energy that's available to you if you have the right frame of mind, and know how to go about it, and know that you have got to take what you need, and leave the rest.

LM: When I moved out of the city six or seven years ago I had this sense that nature was super super fragile, and that people controlled everything; but then I started to see . . .

Taj: Ain't that a revelation? That no matter what we do, she is still there? And like I say, give me a M, give me an A, . . . R, . . . L, . . . O, . . . N. Give me a B, Give me an R, . . . A, . . . N, . . . D, . . . O. And that's where I'm at: Idi Amin, Marlon Brando, Julius Nyere, Mao Tze-Tung. Give me the cats that really be talkin about it, Thomas Merton, Mahatma Ghandi, Inayat Kahn. Men who've really been clear thinkin it through. Buddha, Muhammed. I mean those are people for me. Christ. I mean, that's what I be workin toward, really. I ain't gonna say that I'm no saint, or even move anywhere in that direction. I just do know that those are good men, and that they really worked hard in this life to get themselves to a level. There are others: Lobsang Rampa, Kahlil Gibran. I'm not one who can read unless you really got something to say. But I've read many things by those people, and find myself going back from time to time to look at what I've read, because of how much it meant to my life. Paramhansa Yogananda, and many others. There are more contemporary peoples, but I like the older ones. There's another guy: Bertrand Russell. He's real good. Some of the early things Nkrumah said. And Marcus Garvey. Mostly Marcus Garvey. A lot of Marcus Garvey. A lot of Marcus Garvey and a lot of Mahatma Ghandi. Those are the two that had a big affect, through my father, on my life. And it's taken me to this point in my life to realize that. This earth is a big place, but it's not so big, and we have to have a lot of respect for it. When I look at those pictures of what's on Mars, it looks like people were there at one time, and messed up there the same way that some people are trying to do here. And they had to ultimately go somewhere else and start again. ■

Uhrr upph't

In today's America, they say, "You animal!" "You beast!" as a put-down. Undoubtedly, the Bald Eagle and Whooping Crane say, "You human!" as a curse. But, just 400 years ago, North American religion saw "animal" and "person" as one group of living creatures: "anima-persons." Coyotes talked like human people and humans howled and prowled like Coyote people.

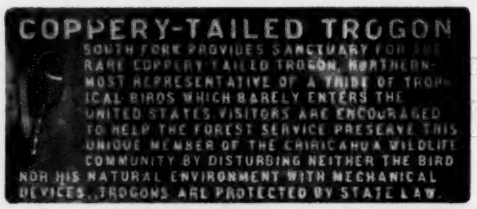
Each tribe also told the story of the "fall" from this paradisical grace: the moment when each anima-person assumed a permanent mask, a separate species form and voice, and could no longer hang out with other species. This harsh separation was caused by uncontrolled anger or fear. The Chanulas (a Mayan speaking-tribe of southern Mexico) say:

> **There was a man who had the custom of going to the woods to talk to jaguars. They understood each other's speech. He decided not to go one day and the jaguar came to find out why he didn't come. He scratched on the roof of the man's house and made terrible noises. He (the man) was scared and tried to make his house jaguar-proof. One night he was sleeping soundly and he thought, securely. The jaguars tore a hole in the wall and ate him. They were angry that the man had not lived up to his agreement to talk to them in the forest.**

Today, with all species having a difficult time, especially human persons with other anima-persons, inter-species communication takes strange forms. Most people talk to their pets which acts as a bridge (domestic vs. wild) to the non-human world. Others, like Lilly, have proposed a satellite-computer-microphone apparatus that would allow a free-living elephant to telephone a free-living dolphin. The computer would change ultra-sonic and sub-sonic sounds into a common speaking/hearing range. Lilly would act as voyeur to see what they said.

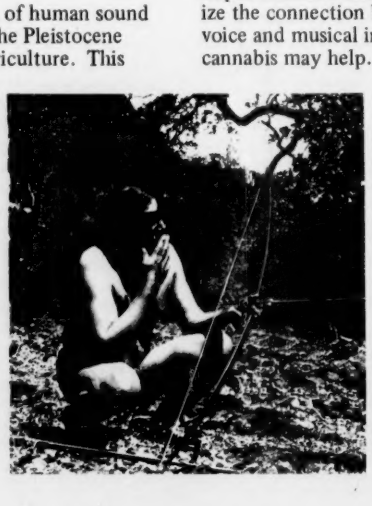
But, the most everyday connection of human sound with animal sound occurred from the Pleistocene until the recent development of agriculture. This period found humans as naturalist-hunters learning to mimic their non-human friends who they both prayed would be plentiful and prayed they could kill. Again, this hunter-naturalist tradition has left strange remnants in the twentieth century.

While Ishi needed to bring deer and rabbits within range of his bow, the twentieth century hunter has telescopic sights on high-powered rifles. While Ishi had to use his own voice to beckon prey, today a hunter can just as easily take a battery powered tape recorder with a pre-recorded cassette of elk mating songs.


COPPERY-TAILED TROGON
SOUTH FORK PROVIDES SANCTUARY FOR THE
RARE COPPERY TAILED TROGON, NORTHERN-
MOST REPRESENTATIVE OF A TRIBE OF TROP-
ICAL BIRDS WHICH BARELY ENTERS THE
UNITED STATES. VISITORS ARE ENCOURAGED
TO HELP THE FOREST SERVICE PRESERVE THIS
UNIQUE MEMBER OF THE CHIRICAHUA WILDLIFE
COMMUNITY BY DISTURBING NEITHER THE BIRD
NOR HIS NATURAL ENVIRONMENT WITH MECHANICAL
DEVICES. TROGONS ARE PROTECTED BY STATE LAW.

A sign in Cave Creek Canyon, Arizona, warning birdwatchers not to use canned tapes of the Elegant Trogon. Birdwatchers, a new breed of twentieth century "hunter," have so disturbed this rare bird that its very existence was endangered. Male trogons in hot pursuit of play-back, leave their mate in courtship, leave their nests unguarded or forget to feed their young. Continuous search for the Sony Trogon physically exhausts them. Rick Taylor designed and built this sign to cool ignorant bird lovers, unknowingly turned bird killers.

There is no doubt that music has become too indoors and too electrified and too tightly bound to Western European traditions. It seems a long time ago that shakuhachi players attempted to reach creative success by sounding like the wind whistling through uncut bamboo. This section hopes to start a series of articles that could revitalize the connection between natural sound, human voice and musical instruments. Plant powers like cannabis may help. So will sitting by a stream. –PW



Left: Perhaps it was a rabbit he (Ishi) had seen or smelled. If so, he would remain hidden, but make a kissing sound with two fingers pressed against his lips: the soft, plaintive cry of a rabbit in distress. While the inevitable rabbits drew near in response to this call, it was well for the hidden hunter to be prepared for more exciting game. A wildcat, mountain lion, coyote, or bear might also respond to this apparent invitation to an easy kill. In Ishi's repertory were also the different quail calls, the gray squirrel's squeak, the honk of wild geese, and many other bird and animal voices.

Right: In flooded timber, the hunter combines mouth blown calls and boot splashing. The boot splashing imitates feeding ducks.

INTERSPECIES MUSIC

by JIM NOLLMAN

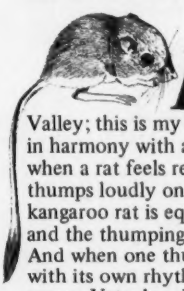
Lewis Watts

Jim Nollman and his waterphone: a metal globe with "tuning forks" attached to perimeter. Chop sticks with "super" balls are used to send waterphone vibrations through the water.

Within the barren interior of the Kamchatka peninsula of northeastern Siberia, live a people who are closely related to the north American Eskimoes. The day to day diet of these Kamchatka people is generally quite austere, and starvation is evidently an accepted fact of life. Yet two times a year, when the huge flocks of migrating ducks pass through their territory, begins a time of great celebration; a time of feasting and merriment. Through the centuries, a body of music has developed for this ceremonial period; a music derived in both name and melody from the call of these aangitsch ducks.

The aangitsch songs serve two important purposes. Firstly, they are essential to the hunt itself. If the songs are sung properly, and in a spirit of true communion, the ducks lose their fear, and come close enough so that a goodly number can be killed to insure a proper feast. The performance of these songs is highly ritualized, and an exacting art; one which requires a refined vocal technique as well as a command of what is known as "the duck energy." Secondly, after the hunt is complete, these same songs are sung throughout the period of celebration, but now by the entire tribe. This is a joyous yet serious business; for if the spirits of the slain ducks are not thoroughly appeased and entertained in their own language, the flocks might not appear again on their next migration. It seems important to add, that like most traditional peoples, the Kamchatka never kill more ducks than they need in order to survive. According to the Kamchatka, the people and the ducks are one and the same.

Besides hunters, birders, pets and scientific techno-communicators, there are the "now primitives" of America. They are the gentlest and simplest of people similar to the Iturbi pygmies in intent. They focus more on harmony of breath, sound and communion than knowledge, "facts" and influence. Jim Nollman, maker of slit drums and musician of many instruments, is trying to re-create "anima-persons" by returning to SOUND as SEED of all communication. –PW



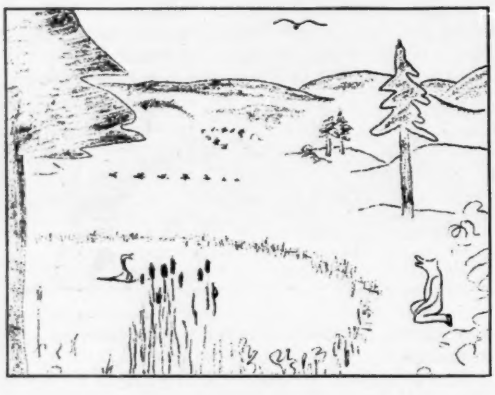
Here I sit within the enormous stillness of Death Valley; this is my fourth night trying to make a music in harmony with a colony of kangaroo rats. If and when a rat feels ready, he emerges from his hole, and thumps loudly on the ground over his burrow. The kangaroo rat is equipped with enormous hind legs, and the thumping can get quite loud and animated. And when one thumps, another inevitably answers, with its own rhythms from several hundred yards away. Yet when I myself try to initiate some

thumping sounds, I never receive an answer. But if a rat does come out, and begins to thump, and if I answer it with a like rhythm, sometimes we are able to carry on a musical conversation for as long as ten minutes. This afternoon I spent over an hour looking for just the right shaped rocks for the occasion; it had been as careful a business as if I were buying a new guitar. The rocks are sometimes struck together, sometimes thumped separately on the ground.

But there has been no thumping, and I have seen no kangaroo rats on this night. I have already sat here for three hours, nearly motionless, and just twenty feet in front of one rat's maze of burrows.

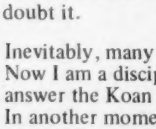
The silence of the desert seems nearly complete, and but for the roar of an occasional jet flying overhead, all I hear is the sound of my own nerves whining away between my ears. Sitting here for three hours, I work to still this buzz in my head, trying to void my own out-of-control nervous energy. I wonder if this nerve noise can be heard by the rats. I don't doubt it.

Inevitably, many thoughts pass through my mind. Now I am a disciple of the Zen master who must answer the Koan "play the sound of the silent rat." In another moment I am transformed into a Shoshone youth out on the floor of the desert night performing his passage into manhood. And yet, just at the moment when I am most lost in these fantasies, a wild mule hee-haws from miles away, and so I am shaken back into the moment.



"Father," said Loon Woman, "I know what I have done. I've spoiled the world. I've spoiled the world and other people are coming. Now I will be Loon and you will be Coyote. We can never be together again. I will live in the lake, and you will live in the brush. But every morning at dawn, and every evening at dusk, I will cry from the lake. Then you will come to the edge of the brush, and you will answer me. That way you know I am living. And I will know you are still living too. Now I must go. You also, you go."

—Jaime de Angulo
Old Doctor Loon



Here live twelve wolves, mostly former pets who had grown from cute little puppies into huge and powerful beasts; in fact much too powerful for their human owners to cope with. The choice came down to shooting them or . . . and so an organization was born: the North American Predatory Animal Center, located in the desert mountains north of Reno. Here, the wolves are kept in large chain link fences. Like most captive beings they spend much of their time pacing back and forth.

As I approach the pack from down the hill, they sing out a song, ostensibly to the setting sun. They stop singing as soon as I come into view.

I have brought several musical instruments with me; and so I play this one, now that one, encouraging the group to sing along. But all of this music just seems to make the wolves tense up, and now they pace back and forth even more furiously.

Finally I give up this rude attempt at human-based music making, and instead sit with them as quietly and as anonymously as is possible. And so, for an hour into darkness I sit alone with a pack of twelve wolves, meditating on this large and ominous chain fence which separates us.

But soon they begin to sing again, a rich piece with a complex contrapuntal structure. I am able to make out most of the individual voices within the whole.

I enter the song with my own voice, try to improvise around the piece of music as I hear it; but as soon as I strike a dissonant note, the whole pack suddenly stops singing. Again they pace back and forth.

Now I stand up and walk over to the largest wolf of the pack: an all white, grandfatherly looking creature named Arctic. I notice that Arctic is constantly lifting his huge head high into the air as if to sing, yet he has yet to join the general song. I sit down inches from the chain fence, and Arctic sits down facing me.

Soon the pack begins to sing again. And soon Arctic joins in. Soon I hear another pack from down the hill singing. And from all over the distant hills, the sounds of barking coyotes adds to the chorus of voices.

Very slowly I lift my head high and quietly chant with Arctic, trying my level best to follow his voice

with a precise harmony. Finally, it seems to me that my harmony is truly harmonious for the very air around us begins to shimmer in sound. Arctic seems to notice also, for at that moment he sings out louder than before. I take this action as an encouragement to sing out.

Such an incredible feeling of elation, chanting an ancient song to the descending night, with a large group of wolves and coyotes. Soon they all stop; we all stop. I sit for an hour longer.

I swim straight out into the open ocean; two hundred yards from shore on this becalmed, coral-studded, blue-green sea. I am able to support my weight by cradling a stainless steel and brass hollow sound sphere known as the waterphone. The waterphone is a musical instrument.

Two hundred yards directly in front, twenty or more fins roll out over the ocean surface in close formation. These are spinner dolphins, and all the accounts say that they are both highly intelligent and friendly to humans. But still, this is the first time that I have ventured so far from shore, alone, with so many large sea creatures about. One small part of my media-cluttered mind brings into focus various shark-infested movie set oceans from my childhood.

I begin stroking the main tube of the waterphone. If I catch its surface with just the right amount of finger pressure, the whole sphere vibrates. Cradling the instrument properly, this vibration courses clear through my body, and so into the water. This whole process tickles.

But the dolphins seem totally disinterested in this sound as they continue about their business of travelling into the middle of the bay. I stop playing for a moment and stick my head into the water to hear. I hear nothing but the lingering vibrations of the waterphone.

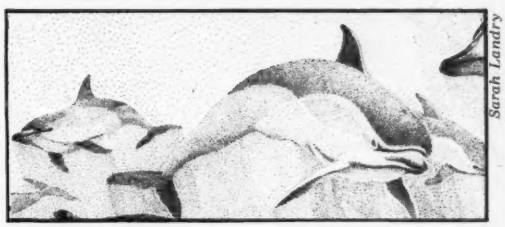
So I change my approach to a shorter, more repetitious tune by rubbing my palm across the brass prongs which rim the equator of the instrument. The rhythm is clear and simple: five seconds of sound, and five seconds of silence. Once again I stick my head into the water. Now the sound of the sphere is so intense that it actually hurts my ears to listen. They say that sound is five times more intense underwater; the mix of my ringing ears and the muffled quiet tones from above water seem to confirm this fact.

Still, the dolphins seem disinterested, and so I change my tune a third time. By striking the center tube with a mallet while simultaneously immersing various parts of the sphere into the water, a ringing tone is produced which rises and falls dramatically in pitch.

Immediately there is a change. The dolphins turn from their straight path and now swim straight toward me. Just fifty yards away, they form into a tight precisely patterned circle, and turn and turn about for a minute or more. This movement reminds me of nothing so much as Israeli folk dancing.

Eventually they break from the circle, one at a time; and move in very close; thirty-forty-fifty feet distance. It is difficult to judge accurate distance with my eyes just six inches above the water surface. But their eyes are quite visible as several of their number lift their heads high above the water surface to look at this strange vibrating being who swims in their midst. I am mostly struck by the immense power of their breathing.

All the time I continue to play these long sliding notes on the waterphone. Once more I stick my head into the water. The sphere sounds clear and sweet: now like an oriental gong, now like a church organ. I listen for twenty seconds, come up for a deep breath of air, stick my head full below the surface again, up and down, over and over. This process of playing and listening seems so clumsy. I feel inadequately built to the task of communing with these creatures of the sea. I still can hear nothing but the sound of the



Sarah Landry

waterphone. Perhaps my ears are just not built to hear the high pitched sounds that the dolphins may be making.

But if I feel inadequate, the dolphins don't seem to notice it at all. All of us are quite together now, human and dolphins swimming on the deep blue sea. One swims directly underneath my feet.

And now, so suddenly as to make my blood rush, one of the dolphins jumps six feet clear of the water, and just a few feet away. In a moment they are all jumping clear of the water, spinning and somersaulting about. All I can manage to do is watch them with a big foolish grin on my face. And from the shore, so very far away, an audience of humans has gathered to watch this interspecies theatre. And now, they too are all jumping about, laughing and clapping: carrying on like a group of happy children. This joy is truly infectious. What more could any musician ask for from a performance.

The dolphins continue to frolic about for ten minutes or so. Soon they move off, and once again form into their precise tightly knit circle, turning and turning about.

Soon they swim off and are gone.

This human being feels shivering cold in twenty-five feet of water; much too far from shore for comfort. Kicking with his rubber frogman's feet, he slowly paddles to shore, where other humans stand, ready to talk to him. ■

ACCESS TO WATERSHED MUSIC

by Peter Warshall

In 1970, Dr. Roger Payne released **Songs of the Humpback Whale** (Capitol). Just whale sound. No human voice. Raga-like feeling. Electronic-like vibrations. The songs of the humpback whale melded easily with electric guitar wah-wah pedals and freed folk-acid-rock from its pedestrian rhythms. Groups like Pink Floyd and singers like Country Joe added humpback songs to their human voices. Result: celebration and prayer for this Great Oceanic Mammal. **Songs of the Humpback Whale** became a new kind of classic, especially when part of the price went to non-profit groups trying to save whale life.

Below are my "top 10" in anima-sound. Each record has, at least, the interesting quality called "seed syllables" in Tibetan Buddhism. These sounds evolved as animal life evolved. The more creatures, the more habitats, the more diverse the sounds. An evolutionary history that produced, among other things, our human species-specific taste in music. This is the "nature" of music. In part, *genetic* sound limited by hearing range, ability to separate tones and timing patterns; and, in part, *community* sound brought to you, in the twentieth century, by plastic records, modern recording equipment and/or the living creatures themselves.

SPECIES MUSIC

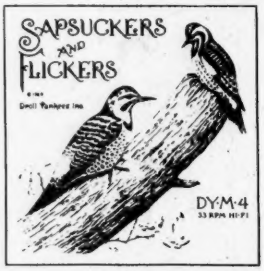
The Songs of Wolves (Columbia) is a "great gift for you and your dog." This record, like the humpback whale record, holds the mammalian mystery in its song. Besides monkeys and apes, whales and wolves combine sounds, emotions and intellect more than any other living creatures. (The cuts are too short. One side is rather unnecessary commentary by Robert Redford. I mean, we could read it just as well.)

Sounds of North American Frogs (Folkways FX 6166, $6.98 ppd) stretches way back into our evolutionary breathing apparatus. Frogs were the first barely terrestrial vertebrates to use their vocal cords to sing. This proto-reptilo-amphibio-mammalian creature sang *basso profundo* in Mesozoic landscapes (200 million years ago). Now, diversified into croaks and trills, "screams" and off-beat gargles, toads and frogs remain the consistent voice of spring, swamp nights. (The cuts are again too short. Every cut is narrated, but I forgive it because Charles Bogert, the human, seems to enjoy himself so much.)

Folkways Records
43 West 61st St., New York, NY 10023

The Frog Pond (Droll Yankees, $6 ppd) features solos by six temperate species in New England. (One side with songs; the other with narrative.) Not as spectacular as Highlands County Florida (on the Folkways album), but cuts long enough to plunge.

Birds are, of course, the *prima donnas* and *virtuosos* of Earth. Arias and duets, even trios, that ornithologists are just recently translating into love songs, statements of personal space and prophecies about predators. Droll Yankees (just get the brochure) has records that let the birds have the stage. This is a great relief for those who have tried the Peterson Field Guide recordings (obtrusive commentators, miniscule cuts, no variation or dialects of the birds, usually one of many calls). **Sapsuckers and Flickers** (DY-M-4; 7" record, $2 ppd) gives one whole side to just two bird species (other side is commentary).



Droll Yankees, Inc.
Mill Road
Foster, RI 02825

The Edge of the Meadow (DY-N-22, $6 ppd) has some of the finest recorded bird song. You hear all the birds so you can sharpen your abilities to hear each separate bird (the "instruments" of the meadow). The flip side has a "Leonard Bernstein" narrator making sure you've got the orchestration straight.

WATERSHED SOUND

Each place has its sound, a music that makes it familiar to all the creatures that live there. **Sounds of a Tropical Rain Forest** (Folkways Science Series FX 6120, $6.98 ppd) was recorded in 1951. No book can sing as well: howler monkeys, the three wattled bell bird, chachalaca. The best intro to rain forest. These anima-sounds are not weird or exotic. Just everyday songs of Peruvian equatorial life.

For North America, few biogeographical regions have recorded their watershed music. Droll Yankees puts out **The Brook** (DY-M-2, 7" record, $2 ppd) and **The Swamp In June** (DY-17, $6 ppd) among others. **The Swamp In June** is my favorite group: Pickerel and Green frogs on rhythm; beavers, flies and birds doing the solos.

In a sense, the place makes the sound, the way a sound studio with 16-track overlays makes the music. The record industry, as part of our consumer economy, has tried to create a national sound for a national

market. But, regionalism keeps innovating "progressive country" or "reggae" – sounds glued to location.

The desire of human music to fill the spaces left by non-human creatures, creeks and breezes was (is) still happening in pre-writing cultures. First, mimic the creatures, wind and water of where you live. "To mimic" exquisitely replaced "creativity" in tribal cultures. Then, learn the easy "breath" sounds that are basic: the mantra or chant of humans. Last, blend mimicry and human breath with drums, flutes, rattles and stringed bows. Result: the sound of the place.

Ba-Benzele Pygmies (UNESCO Collection, No. 3, Barenreiter-Musicaphon BM 30 L 2303, $9 ppd, cheaper at local stores) is number one in watershed music. Two women chirp in call-answer sweetness. An old man tells the story of a gorilla, while playing the part. Forest and humans harmonize.

UNESCO Collection
UNIPUB
Box 433
Murray Hill Station
New York, NY 10016

The Eskimos of Hudson Bay and Alaska (Folkways Ethnic Library FE 4444 B, $8.95 ppd) has the best walrus mimicry on Earth and a fine rendition of the ptarmigan. Mostly laughter and joy as various dances and games (all cuts are too short) combine and emerge as dance-song, game-song, hunting-song, story-song.

THE BIO-CENTENNIAL PROJECT

"We're starting a record company which will also be an environmental foundation. Bio-Centennial records.

"The Bio-Centennial label will provide musicians with helpful alternatives to super-stardom and wealth. Nobody connected with the label in any manner gets more annually than the latest average annual wage for a U.S. adult. Profits beyond that go to Bio-Centennial environmental projects on behalf of all species simultaneously. In fact, after we've sold 5000 copies of this record we'll start putting half the profits into the Bio-Centennial All-Species Fund.

"Kindred Souls music – our first release – is bio-regional music: Northern California Transcendental Folk Jazz."

[Suggested by Ponderosa Pine]

The Mouth of the River: Concluding Notes

As "Editor" one becomes the visible image and force who gets too much credit and too many complaints. Behind this visible fol de rol are the invisible forces that provide the continuities and strength among the ups and downs and loose and looser ends. Diana Fairbanks is the invisible angel of this issue (and probably most others). "Production Manager and Paste-up" hardly describes her super-competence in elegant page lay-out, in offering quiet and precise advice and keeping the flow going as personnel (like myself) and circumstances space-out. Gracias, amiga.

You may have noticed that RIVERS are hardly apparent. We were flooded with suggestions but the whole focus was so grandiose that I decided to wait for a future issue (if there are many more, see Financial Report, p. 143.) Thanks to those who sent suggestions and anyone else with a favorite river book should write and tell us.

There were also great gaps in human/watershed interaction: What's a good dam? Can you wring-out clouds? Does the global layer of oil covering the seas change the weather? When are inter-watershed transfers useful? Can agri-business exist without turning land into a salt desert? Can you really reclaim strip-mined land? Aquaculture and the Estuary. Radioactive Substances and the Biogeochemical Cycle. Sorry folks. In 90 pages, you can't write **Watershed: War and Peace.**

Hereby acknowledged: Jon Halpern for early input; Richard Grossman for the Black Lake manuscript; Jeanne Campbell for noticing an article was "flakey" and other right-on editing and opinions; Evelyn Eldridge for talking turkey. The **CQ** *staff wanted a group photo of us all but we forgot the "Statement of Ownership" till the last minute (thank you, Don Ryan). It replaces our volleyball frontal portraits.*

–PW

Understanding Whole Systems

Obviously the preceding 93 pages of 'Watersheds' is part of 'Whole Systems'. We're drawing a distinction here merely to indicate the transfer from Peter Warshall's editorial domain to mine. –SB

The case against the case for Mind/Body Dualism

[In the Fall '76 CQ *psychology professor Charles Tart said that certain out-of-the-body experiences he had studied suggest that mind may indeed be separable from body. Gregory Bateson replies:]*

Dear Stewart,

My first response to Charles Tart's defense of Mind/Body Dualism was, "O God, do we have to go back, again, to the late Paleolithic?"

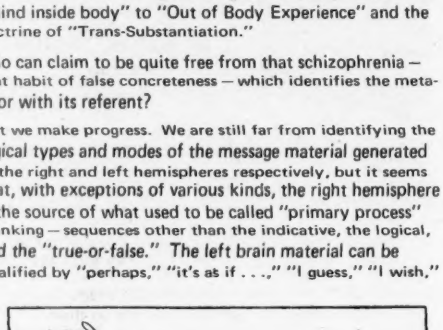
And then: "But, after all, the cave paintings are still among the world's great works of art, and the emphatic totemism which surely accompanied them must have been one of the world's most loving and most ennobling religions."

But was that religion a bunch of dualisms of Mind/Body, God/Man, and the rest?

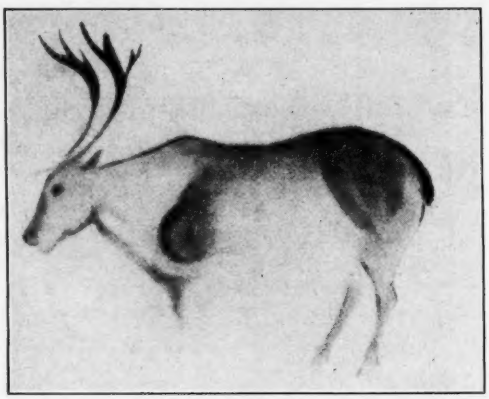
And obviously, the cloven hoof was already there. Think of the "Sorcerer" of the Trois Freres cave. If ever religion graphically proposed dualism, it was by the sanctification of masked figures. It is a slippery sequence of dualisms from "man inside mask" to "possessing demon inside lunatic" to "mind inside body" to "Out of Body Experience" and the doctrine of "Trans-Substantiation."

Who can claim to be quite free from that schizophrenia – that habit of false concreteness – which identifies the metaphor with its referent?

But we make progress. We are still far from identifying the logical types and modes of the message material generated in the right and left hemispheres respectively, but it seems that, with exceptions of various kinds, the right hemisphere is the source of what used to be called "primary process" thinking – sequences other than the indicative, the logical, and the "true-or-false." The left brain material can be qualified by "perhaps," "it's as if . . .," "I guess," "I wish,"



The "Sorcerer" at the cave of Trois Freres



Reindeer at the cave of Font-de-Gaume (Dordogne)

"I see," "I heard that," and so on. And such qualification saves the material from the false concreteness which indicative messages will always propose, and which the undisciplined left hemisphere commonly prefers. "It's six o'clock" seems less ambiguous than "Time and the bell have buried the day." But do not be deceived into thinking that T.S. Eliot's line means "the pubs are now opening."

The metaphors of the right brain are not and cannot be qualified – do not need qualification. Try it: "It is as if the day were buried by time and the bell," or "I guess time and the bell somehow together buried the day," or "which day did they bury?"

Try doing this sort of thing to the whole passage.

Time and the bell have buried the day,
The black cloud carries the sun away.
Will the sunflower turn to us, will the clematis
Stray down, bend to us; tendril and spray
Clutch and cling?
Chill
Fingers of yew be curled
Down on us? After the kingfisher's wing
Has answered light to light, and is silent, the light is still
At the still point of the turning world.

–T.S. Eliot, in "Burnt Norton,"
from **Four Quartets**

But what does it mean?

That, Stewart, is the thaumaturgist's question, which invites the vulgarity of the fundamentalist. If you spell the question out, it means: "How shall we say the same thing in the language of the left brain?" And the correct answer is simply, "Don't try. It cannot be done." The left brain can not achieve that particular qualification of its own utterance which is inherent, and therefore not further needed, in all right brain productions. It is the folly of the deaf linguist to believe that translation is commonly possible.

And when attempted, translation from the right to the left is teratogenic, a creating of monsters. My anthropological colleagues have done their share of this. They assert, against all aesthetic sense, that the paleolithic frescoes were magical devices to enable the hunters to kill the beasts.

Perhaps the people who leave their bodies could stay with their bodies if they once could grasp the fundamental truth

that religion is unifying and ancient, where magic is divisive, degenerate, and late. Rituals first affirmed man's unity with weather, landscape, beast and fellow man. Only later did the rituals come to mean appetitive control of this and that. The Body/Mind dualism is appetitive.

Were those beautiful reindeer and bison – so alive, so precise in posture and movement – were they perhaps some atonement (at-ONE-ment) for the killing?

Be all that as it may, it is still so that to be fully present in the present, here and now, and of the Body, is strangely difficult. Sometimes, I am told, a *koan* will help us in this "occupation for the saint."

To explore the womb, or tomb, or dreams;
all these are usual
Pastimes and drugs, and features of the press;
And always will be, some of them especially
When there is distress of nations and perplexity
Whether on the shores of Asia, or in the Edgware Road.
Men's curiosity searches past and future
And clings to that dimension. But to apprehend
The point of intersection of the timeless
With time, is an occupation for the saint –
No occupation either, but something given
And taken, in a lifetime's death in love,
Ardour and selflessness and self-surrender.
For most of us, there is only the unattended
Moment, the moment in and out of time,
The distraction fit, lost in a shaft of sunlight,
The wild thyme unseen, or the winter lightning
Or the waterfall, or music heard so deeply
That it is not heard at all, but you are the music
While the music lasts. These are only hints and guesses,
Hints followed by guesses; and the rest
Is prayer, observance, discipline, thought and action.

–T.S. Eliot, in "The Dry Salvages,"
from **Four Quartets**

–Gregory Bateson
Santa Cruz, California

The Promise of the Coming Dark Age

This book is a rich work of contemporary scholarship – full of good stuff. In some ways, the flesh is better than the bones of it. The Promise is: a diverse decentralist world humming with development at many levels, from the neighborhood to the nation. The tendencies which are leading us there are: "Demo-Technology," Worker Control, Participatory Democracy, and Self-Actualization: obvious, but nice bones.

Ah, but the pleasures of the flesh! Lots of his evidence is news; Stavrianos has admirable taste in information. There are sketches of rural industrialization in China, an experiment in "total systems" work enrichment at a Proctor and Gamble plant, McGovern's campaign and defeat, the successful revolution in Guineau-Bissau, the insights offered by Soviet dissidents, and the inequities underlying the Brazilian economic miracle, to give a few examples.

Being a responsible intellectual, Stavrianos balances things fairly. He admits the flaws in the exemplary systems -- thus a nice comeuppance effect, which is the truth of an innovative situation. Just as you're beginning to think that Yugoslav experiments in worker control of factories spell the wave of the future, he tells you what the problems have been, then moves you on over to another drawing board.

Using economic analysis akin to that in Global Reach, *he demonstrates the fallacy of advocating the growth of multinationals as a means to pervasive economic development. Stavrianos disproves the Kahnball case for trickle down economics with a glance at wage, price, and income differentials, not the grosser evidence of average per capita income and expanding GNP.*

Information-wise, the world is this guy's oyster. His global comprehension and historian's time frame persuade me that the leftwing sixties accusations of imperialism were only correct. "Western powers are the implacable opponents of Third World Westernization," he states, then describes a repeating pattern: the deathgrip colonial decision to take the counter-revolutionary side in wars of national liberation. He concludes this argument by recording a series of American proclamations that victory in Indochina was at hand – like Walt Rostow saying, "The Vietcong are going to collapse within weeks. Not months, but weeks." That was '65.

However, this book is definitely not in the piss-on-America genre; it's more like writing on a wall. Regarding the world as a realm of dynamic civilizations, rather than a competitive gaggle of nationstates, offers a refreshing perspective. Civilization implies the cultural dimension of historic change.

Is it a curse or a blessing to live in interesting times? The latter if we can be wise enough to delight in the sight of grass sprouting up in the cracks of our cherished pavement. Stavrianos offers us a spectrum of developments that tend towards a liberation of humanity; that hope, arching in the noosphere, is a covenant to lighten up a present dark age.

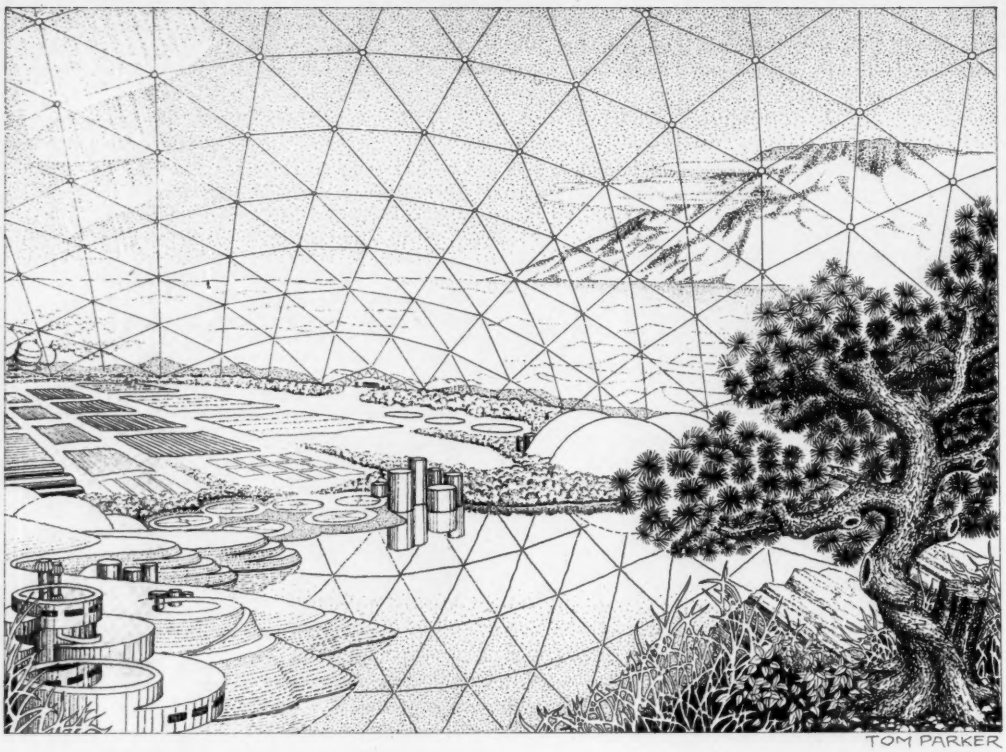
–Stephanie Mills

The Promise of the Coming Dark Age
L. S. Stavrianos
1976; 211 pp.
$4.95 postpaid
from:
W.H. Freeman & Co.
660 Market Street
San Francisco, CA 94104
or Whole Earth

Among the Romans, the early Christians attributed imperial decline to moral decadence. Both Saint Jerome and Saint Augustine wrote that the ancient Roman virtues had deteriorated and that the only way to turn was toward the City of God. But later, when the deterioration of the Empire proceeded apace even after the acceptance of Christianity as the official state religion, the pagans in their turn laid the blame for Rome's decline on the hostility and disruptive practices of the Church. Whereupon the Christians, having become a part of the Establishment, now shifted their attitude in order to justify their support of it. The Roman Empire, they contended, represented the last of four world kingdoms – its predecessors being Babylon, Carthage, and Macedon – and was designed to be God's shield for the protection of the Christian world against chaos. Accordingly, all Christians should accept and support the Empire, for on it depended the fate of the universe. As the current saying went, "When Rome falls, the universe will fall with it."

•

A reason for doubting the assumption that mankind cannot change its ways is indicated by the current paradoxical combination of global unity and global diversity. The unity is readily apparent in instant mass-communication media and the space voyages of astronauts and cosmonauts. Equally significant, however, although less obvious, is the unprecedented diversity in social philosophies and institutions. The variety in the Western world ranges from the United States to Sweden, in the Communist world from Yugoslavia to North Korea, and in the underdeveloped world from Bolivia to Tanzania. A significant new social mutation also appears to be emerging in China. In a shrinking world of such diversity, any creative achievement anywhere quickly becomes common knowledge. Sooner or later, enthusiastically, or grudgingly, it is studied and discussed and then imitated, adapted, or rejected. The net result is global interaction and cross-fertilization. The law of hybrid vigor operates in the cultural realm as well as the biological.



TOM PARKER

Ecological Considerations for Space Colonies

by
Antonio Ballester, Barcelona, Spain
E.S. Barghoorn, Cambridge, Massachusetts
Daniel B. Botkin, Woods Hole, Massachusetts
James Lovelock, Bowerchalke, Wilts., U.K.
Ramon Margalef, Barcelona, Spain
Lynn Margulis, Boston, Massachusetts
Juan Oro, Barcelona, Spain
Rusty Schweickart, Washington, D.C.
David Smith, Bristol, U.K.
T. Swain, Boston, Massachusetts
John Todd, Hatchville, Massachusetts
Nancy Todd, Hatchville, Massachusetts
George M. Woodwell, Woods Hole, Massachusetts

There appears to be growing interest in the possibility of establishing large space colonies capable of supporting hundreds or thousands of people in isolation from the earth for long periods (for example, see G. O'Neill, **Co-Evolution Quarterly**, Spring, 1976). Such colonies would present extremeley difficult biological and ecological problems. These should be addressed at the very outset if any serious effort toward designing satellites or colonies on celestial bodies other than the earth is to proceed. This statement is the product of a series of discussions held in Woods Hole on May 14 and subsequently with scientists who have had experience in the study or design of closed ecological systems and who express concern lest the problems of developing congenial livable conditions on artificial or natural satellites be considered engineering problems rather than basic humanistic and biological ones.

The proposal is considered a logical and exciting extension of our space exploration and pioneering. It is to build a new meta-stable ecosystem, complete with biotic resources and closed cycles for other essential resources, and capable of supporting man over long periods. No such system has ever been constructed on earth. The probability that such a system can be built and maintained indefinitely at present seems remote. It seems especially remote when we realize that we have no background in the analysis of the problem and no technical or scientific research programs underway at present to develop the background. One of the current theses of economists and technologists is that economic and industrial growth is necessary for support of contemporary

The product of one large meeting and many individual conversations, this criticism and proposal brings rigorous ecosystem biology into the Space field for the first time. The text and the agreement about the text were carried through largely by Lynn Margulis, George Woodwell, and Dan Botkin. The statement is appearing simultaneously in **The Ecological Bulletin.** *Ecology may slow down Space mega-exploration. Space exploration may expand ecological understanding by at last permitting research on progressively more closed ecological systems.*

–SB

industrialized societies. As the earth becomes more crowded and its resources depleted the options for growth become progressively circumscribed. Yet problems of expansion into space also seem nearly unsurmountable. People from industrialized societies might not accept the limitations on their activities that life in such a colony would require: limitations on ownership of private property, procreation, travel, and psychological adjustments in interaction with others. Nonetheless, the question of space colonization should be explored.

Our experience leads us to believe that the greatest probability of success in establishing a space colony that might remain for as long as 25 years would be derived by adapting a large natural ecosystem on earth to the support of man. By large we mean in addition to surface area, a high diversity and high degree of patchiness. The versatility of forested areas, subtropical savannahs, and coastal environments and the success of man in adapting such ecosystems to human support leads us to the conclusion that the focus should be on such areas. With this background we would advance a very preliminary list of issues as worthy of immediate consideration before further commitments of funds or time are made.

1. Do all space colonizations intrinsically depend on exploitation of earth resources or, at least in principle, can independent and eventually productive ecosystems be established anywhere in the solar system?

2. A viable space station that has the possibility of being stable in its basic biotic structure over a period of 25 years would probably require an area of several square miles. The total amount of primary productivity, its diversity, and its distribution between food and fiber and the stabilization of other resources and potentiality for recycling will obviously determine the upper limit of the number of people that might be sustained. Do we in principle have the technological capabilities to launch or establish such large colonies?

3. Decisions would have to be made as to the minimal volumes required to sustain segments of the ecosystem and minimal volumes to sustain individual populations within it. The knowledge of minimal volumes is in its infancy and the relationship between stability and minimal area has been established only in the most rudimentary ways. In general larger more diverse ecosystems are more stable; if stable and productive closed ecosystems could not be made to function on Earth they certainly would not function in orbit.

4. The distribution of major mineral nutrient elements is a major problem. All organisms on earth require six major elements in abundance: carbon, hydrogen, nitrogen, phosphorus, sulfur and oxygen. There are an additional six to ten that seem to be universally required and there are probably 30 more that are required in special circumstances by certain organisms. Almost any ecosystem would contain these elements, yet their proper delivery and removal, their cycling, is a serious challenge. Elements must be delivered in the optimal quantities and proportions and in appropriate chemical form. Often they are required as gases. We must be concerned with the biological and geological and man-made informational systems that distribute essential elements.

5. Most productive forests, mixed agricultural and coastal ecosystems are attuned to seasonality, which implies appropriate variations in precipitation and temperature. One must recognize at the outset that natural ecosystems will not remain in their initial condition but will change by both succession and evolution. The design of the allowable maximum and minimum ranges of variation of ambient conditions in an orbiting space colony may be a serious problem.

6. Because the major source of energy to drive this basic unit of nature is solar, the question of the spectral distribution of incident energy, the quantity and periodicity of electromagnetic radiation at each wavelength, must be considered and controlled.

7. It will be essential that water be recirculated within the colony, delivered to the vegetation at appropriate intervals, collected, used in irrigation and for other purposes. We recognize the desirability of something similar to a coastal system with both terrestrial and aquatic components.

8. We must consider the choice of an agricultural base that will tend to maximize photosynthesis and provide a stable supply of food.

9. The stabilization of the basic ecosystem will require redundancy in its diverse systems. For example, often interaction between populations of organisms ranks more important for the stability of an ecosystem than the activity of single organisms. Very little is known about this. How many different types, for example, of nitrogen-fixing organisms should be present? What organic systems and mechanisms for chemical conversion of nitrogen would be required to allow for failures?

10. Eventually, the psychological and sociological challenge of confining people to small places for much of their lives must be considered. The potential for malfunction of small ecosystems seems large: the probability of disease microbes, fungal infections of plants and other disasters must be estimatable.

11. For a rational space strategy the order of approach to the problem is critical. The basic ecological problems must be attacked on earth first, then in near space orbit. Only after successful self-contained systems have proved feasible on earth for some time ought such systems be launched.

This list of issues is obviously incomplete. The challenges of space are much greater than the same challenges on the surface of the earth. Until there is evidence that we are capable of meeting these challenges on earth, there is little point in attempting to address them in space. If a serious effort is to be made in the development of livable space colonies, research should be started on the design and construction of closed agro-industrial ecosystems on earth. The experimental systems might be two to ten times larger than those expected ultimately to be used in a space colony. This extra size might ease the problem of stabilizing the system over longer periods. Earth based and preliminary orbital experiments should include both aquatic and terrestrial components and should be conducted in an atmosphere simulating in its main features that of the earth. The experiments might use technological approaches in partial recirculation of gases and water. As experience is gained, there is the hope that the techniques developed might be used in the design of cities and in the modernization of existing cities.

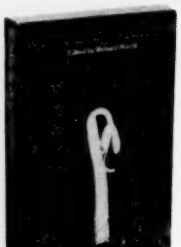
Although the probability of developing space colonies appears to be extremely remote, we would suggest that the scientific challenges and the magnificent opportunity for exploration intrinsic in that objective are appropriate to the contemporary world. We would agree with others that the time to explore these issues is now and that the answers may prove to be not only exciting but a great boon to earthbound man and to earth-based problems in human ecology. ■

Radical Agriculture

The range and quality of material assembled in this one book make it unique. Merrill, a west-coast New Alchemist, has a list of contributors that reads like a Who's Who of the alternative agriculture movement — Wendell Berry, John Todd, Jim Hightower, Michael Perelman, Peter Barnes — to name a few. The essays are well balanced between critiques of what's wrong with modern agriculture and explanations of what some of the possible alternatives are: self-sustaining agriculture, urban polyculture farming, aquaculture, community food organizing, biological pest control.

The buzz you can get reading here comes not from revelling in fantasies for romantic ex-urbanites, but from discovering chunks of an emerging, workable agricultural future.

—Richard Nilsen



Radical Agriculture
Richard Merrill, Editor
1976; 459 pp.
$6.95 postpaid
from:
Harper and Row
General Books
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth

CONTENTS

Radical Agriculture *Murray Bookchin*
Where Cities and Farms Come Together *Wendell Berry*
Land Reform in America *Peter Barnes*
Agribusiness *Nick Kotz*
Corporate Accountability and the Family Farm *Sheldon L. Greene*
Efficiency in Agriculture: The Economics of Energy *Michael Perelman*
Hard Tomatoes, Hard Times: The Failure of the Land Grant College Complex *Jim Hightower*
The Green Revolution: American Agriculture in the Third World *Michael Perelman*
The National Sharecroppers Fund and the Farm Co-op Movement in the South *Robin Myers*
The Invisible Workers: Labor Organization on American Farms *George L. Baker*
Land Disputes at the Urban-Rural Border *Paul Relis*
Urban-Rural Food Alliances: A Perspective on Recent Community Food Organizing *Darryl McLeod*
Organic Force *Jerome Goldstein*
Polyculture Farming in the Cities *Warren Pierce*
A Modest Proposal: Science for the People *John Todd*
Toward a Self-Sustaining Agriculture *Richard Merrill*
Aquaculture: Toward an Ecological Approach *William O. McLarney*
Insect Population Management in Agro-Ecosystems *Helga and William Olkowski*
Small-Scale Utilization of Solar Energy *John F. Elter*
Local Energy Production for Rural Homesteads and Communities *Donald Marier and Ronald Weintraub*

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The radical agriculturist sees agriculture not only as science but also as art. The food cultivator must live on intimate terms with a given area of land and develop a sensitivity for its special needs — needs that no textbook approach can possibly encompass. The food cultivator must be part of a "soil community" in the very meaningful sense that she or he belongs to a unique biotic system as well as to a given social system.

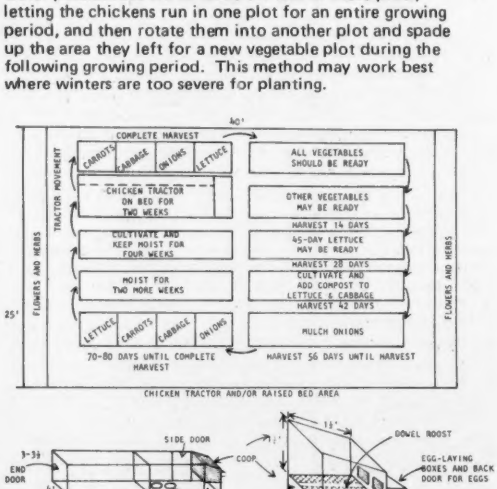
•

Free enterprise does not merely imply the right to be big. It also implies the right to start. As corporate farms become increasingly integrated with processors and distributors, as they advance toward the technological millennium in which ten-mile-long fields are sowed and harvested by computer-controlled machines, the right to get a start in agriculture will be obliterated.

•

If the "chicken-tractor" mixed-husbandry method is used, chickens six weeks old or older (about eight of them) must be raised for the "tractor." Barelegged brown egg-layers are the best since they get along well with each other, scratch up the earth well, and produce fine eggs. The tractor should be roughly the length of the bed and maybe a foot wider to allow the chickens to forage in one of the paths beside the bed. If they are fed grains, garbage, grass, and alfalfa, the chickens will give an egg a day in good weather, they will clear out all weeds, slugs, and insects, and they will work their manure and some garbage scraps into the soil fairly uniformly. If sorghum is in the feed they may leave this behind; it will sprout after the chickens have moved on to the next bed. Move the chicken pen to the next plot every two to four weeks, depending on how rich the soil should be. Immediately after the move, the ground should be cultivated. Fluff up the soil with a turning fork, cultivator, and a rake so that it is two to three inches higher than the normal ground level (called "raised beds"), and thus the roots can obtain more oxygen. Leave the bed open and keep it moist for about four weeks. At the end of this period, add 50 to 100 pounds of compost to the bed. Then carrots may be seeded, or else onions, lettuce, and brassicas transplanted into the bed. Approximately three to four weeks before the chicken tractor is to be moved on to a certain bed, seed that area with oats, wheat, or rye. Then when the chickens are moved to that place they will have the equivalent of spring grass, which is probably the best food of all. Do not expect great results from this method at first, because the timing and bed preparation may have to be adjusted for your area. However, you will learn a great deal from it.

Other possibilities are to fence off two or more plots, letting the chickens run in one plot for an entire growing period, and then rotate them into another plot and spade up the area they left for a new vegetable plot during the following growing period. This method may work best where winters are too severe for planting.



Suggested planting and rotation scheme for the "chicken-tractor" mixed-husbandry method of cultivation with ten beds under rotation.

Secrets of Companion Planting

Companion planting is becoming a prime focus of non-chemical agricultural research because so little is known about what really works. This book is based on applied botanical knowledge, agricultural wisdom, and good sense. Good enough for now since the scientific results will be a long time coming. It is similar to, but far more comprehensive, than **Companion Plants** *(CATALOG, p. 53).*

—Rosemary Menninger

Secrets of Companion Planting for Successful Gardening
Louise Riotte
1976; 219 pp.
$4.95 postpaid
from:
Garden Way Publishing
Charlotte, VT 05445
or Whole Earth

LETTUCE (*Lactuca sativa*). In spring I keep a supply of small lettuce plants growing in cold frames. When I pull every other green onion for table use I pop in lettuce plants. They will aid the onions, and the compost in the onion row will still be in good supply for the lettuce to feed on, while the onion will repel any rabbits.

Lettuce grows well with strawberries, cucumbers, carrots and it has long been considered good to team with carrots and radishes. Radishes grown with lettuce in summer are particularly succulent.

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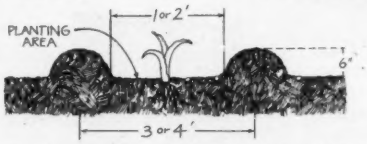
Garlic and onions are particularly beneficial to roses. In Bulgaria, where attar of roses is produced for perfumes, it is a common practice to interplant them with roses since they cause the roses to produce a stronger perfume in larger quantities.

Organic Gardening in the West

Techniques for gardening in a semi-arid climate include: "depressed bed planting," which is a variation on the Hopi Indian method of planting in arroyos; pine needle mulching; and excellent tips on adapting specific vegetables to the conditions of mountain climate. I heard some of these ideas when I lived in Colorado, but they rarely appear in print. Hopefully, this book indicates a trend for more localized garden writing. So many gardening books are being based on the Vermont climate that people all over the country think they have to lime their soil and plant in June.

—Rosemary Menninger

Organic Gardening in The West
(Raising Vegetables in a Short, Dry, Growing Season)
Robert F. Smith
1976; 96 pp.
$4.95 postpaid
from:
The Sunstone Press
P.O. Box 2321
Santa Fe, NM 87501
or Whole Earth



Growing vegetables in depressed beds, which I am about to describe, is just the opposite of the usual practice. Plants are usually raised on ridges with irrigation water running in trenches between them. In this way, the soil is well-aerated, and it warms up fast in the spring.

When springs are wet and the drainage poor, the usual method is justified, but in our semi-arid climate, with spring winds and persistent drought, depressed planting without separate irrigation trenches is to be preferred. The soil stays moist longer, and beds are protected from the winds by the ridges between them. Because of good drainage, high evaporation, and dry air, we never have a problem with plants being too wet. The ridges also serve as paths so you never need to walk on the growing area itself.

Young Farmers' Homestead Act

It has long been a cliché that a young person interested in farming as a profession either has to inherit or marry into a farm. Fewer farmers, larger farm size, and increasing operating costs have only made the problem worse. Who will be owning and operating the farms of the future? Will it be a franchise arrangement, like a MacDonald's chain, with vertically integrated corporations owning the land and buying the crops? Will the Jeffersonian notion of many small, independent, and free landowners go down the tube?

Consider some typical statistics — in this case dairy farming in Wisconsin. 51,000 dairy farms in 1975; down from 127,000 in 1953. Larger herds, automatic milkers, improved breeding,yes; but who is running the farm? 80% of Wisconsin dairy operators today are over 45 years old, and 38% are 55 or over. When you consider that over half of all Americans living today were born after 1945, farming begins to look like a dying art.

As a partial solution to this trend, George McGovern introduced the Young Farmers' Homestead Act of 1975 — S. 2589. Hearings were held last summer, and McGovern plans to rewrite the bill to overcome some objections and re-introduce it next session.

The model for the Act comes from the Canadian Province of Saskatchewan, which in 1972 began land-banking farmland. The government buys available farmland at market prices and then leases it to young family farmers. After 5 years the farmer can either begin buying the land from the government, or he continues to lease. By 1975, Saskatchewan had 1400 farm families in family sized units on a half million acres of leased farmland.

McGovern's bill limits the lease period to 7 years, at which point the farmer either begins buying the land or leaves.

The maximum size of the farm unit (land and buildings) cannot exceed $200,000, based on Farmers Home Administration appraisals. Some critics contend that this size unit is not large enough to be economically viable.

The notion of the government competing in the marketplace for farmland against other farmers of course drives bankers and large farmers up the wall. But how many of these large farmers really farm, as opposed to being absentee, tax-shelter investors, is an arguable point.

Arrayed on the other side are liberal farm-state Democratic co-sponsors of the Act, including Nelson, Mansfield, Mondale, Clark and Hart. In establishing a national policy to encourage independent family farm units, McGovern sees his bill as a companion piece to the original Homestead Act of 1862.

For more information, you can write Senator McGovern at the Committee on Agriculture and Forestry, U.S. Senate, Washington, D.C. 20510.

—Richard Nilsen

Seed money

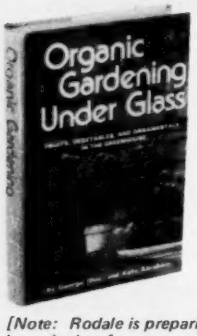
Any large organization or government branch that wishes to distribute nominal cost vegetable seed can do so at a profit, as a fund-raising project. The Asgrow Mandeville seed company, a subsidiary of Upjohn pharmaceuticals, will sell the seed for 6 to 15 cents per packet, printing your logo on the packet. Minimum orders: 150 Family Collections (of 10 packets). They would like to deal with just one coordinating group per metropolitan or rural area. Contact: Rocky Pirro, Premium Manager, Asgrow Mandeville Co., Inc., Cambridge, NY 12816, (518) 677-8511.

—Rosemary Menninger
[Suggested by Mark Malloney]

Organic Gardening Under Glass

This is the best book yet on food crops from greenhouses. More detailed than most outdoor gardening books on cultivation of specific plants. Good herb section, and general information on growing plants in containers.

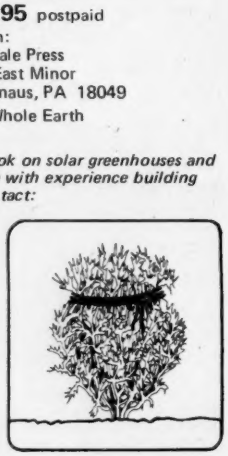
—Rosemary Menninger



Organic Gardening Under Glass
(Fruits, Vegetables, and Ornamentals in the Greenhouse)
George and Katy Abraham
1975; 293 pp.
$8.95 postpaid
from:
Rodale Press
33 East Minor
Emmaus, PA 18049
or Whole Earth

[Note: Rodale is preparing a book on solar greenhouses and has asked us for names of people with experience building or using them. If interested, contact:

James C. McCullagh
Director, Intermediate Unit
Rodale Press, Inc.
Organic Park
Emmaus, PA 18049]



To make endive more tender, blanch the inner leaves by pulling and tying the outer ones up and over the heart. Leave the head tied for about two weeks, then harvest.

MUSKMELON (*Cucumis melo*): The muskmelon, or cantaloupe, makes a good item for your home greenhouse. Many people will pay a dollar or more per melon to sample its delicious, sweet orange flesh, yet a packet of seed costing a fraction of this price will produce dozens of vines, and each vine is capable of yielding eight or more luscious fruits.

Under Glass Tips: Melon growing really is very easy, but many beginners are discouraged because of the amount of space these plants occupy. What few people seem to realize is that melons will grow happily up a trellis and the heavy, ripening melons can be supported by "slings" of cloth, so that they occupy no more bench space than tomato plants. Also, you can grow melons in tubs by training the vines on a cylindrical fence with a 6-inch mesh.

Melons are heat lovers, so you shouldn't have trouble with them in your greenhouse. Select varieties which are fusarium wilt-resistant, such as Delicious, Iroquois, or a hybrid known as Harper Hybrid. Harper is one of the best tasting melons we've grown, indoors or out.

Liklik Buk

The Whole Earth Catalog *of New Guinea (in fact, they excerpt us on wind generators). The best section is Crops, which carefully describes the cultivation of a broad range of tropical plants including fruits, nuts, vegetables, spices, coffee and energy crops.*

—Rosemary Menninger

Liklik Buk Bilong Kain Kain Samting
(A Rural Development Handbook/Catalogue for Papua New Guinea)
The Melanesian Council of Churches
1976; 136 pp.
$4.00 postpaid
from:
Office of Agricultural Secretary
Melanesian Council of Churches
Box 80, Lea
Papua, New Guinea

Oil From Coconuts

We include this in order to draw your comments. For some reason this process is not popular. Tell us about your experience with it.

This is a traditional method for extracting oil from coconuts. The usual use of such oil has been for oiling the hair and body, especially for feasts. In Tonga you can see plenty of such coconut oil in small bottles being sold in the markets for this purpose.

Coconut oil is also good for cooking, and for making soap. In the Philippines many people in the rural areas used it for fuel during World War II to run their small diesel engines for rice and corn mills when no other fuel was available.

Ingredients needed: Mature fresh coconuts

Equipment needed: Large cooking pan
Coconut scraper
Optional: oil press and cloth bag for squeezing grated coconut

The Process:

1. Grate the mature fresh coconuts as you would for most cooking purposes.
2. Squeeze out the cream, either with your hands, or with a cotton sack, or better still, with a small press.
3. Rinse out the grated coconut with the water, and squeeze that, too.
4. Cook the combined cream and the rinsed (coconut milk) gently over a fire. The oil will gradually rise to the surface and become somewhat clear.

Note: We understand that this oil will not keep for a long time, and that it can make people very sick if they eat it when it is too old.

The residue from squeezing the grated coconut is useful for cooking purposes or for animal feed.

Have any of you found a more satisfactory village level method for extracting and preserving coconut oil?

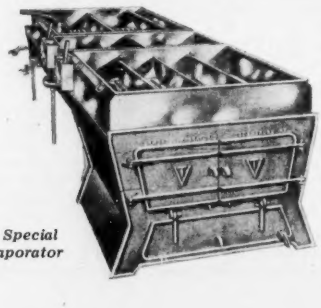
Maple sugar equipment

The talented maple tree — source of leafy autumn fireworks, good furniture, good firewood, and a springly by-product of sweetness and something interesting to do during the maddening final snows of the year.

For how-to, see the Nearings' **Maple Sugar Book** *(CATALOG, p. 62). For equipment, shop here for mailorder evaporators, tanks, pumps, buckets.*

—SB

Catalog Free
from:
Leader Evaporator Co., Inc.
25 Stowell Street
St. Albans, VT 05478



Vermont Special 3 Pan Evaporator

Soft Technology

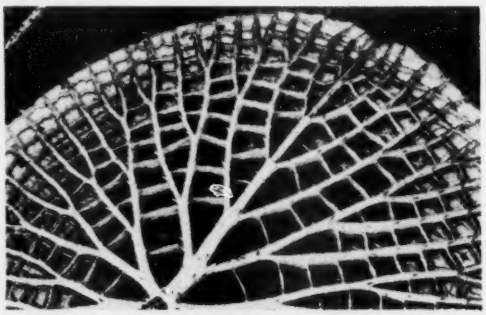
Nature, Mother of Invention

It's difficult to live in the same vicinity as someone who is reading this. You keep getting interrupted: "Far OUT! There's a single bush in Pennsylvania that's a mile and a third across!" or "Want to know how a tree keeps branches that weigh tons from drooping?" Mr. Paturi has written a book that not only is a knowledgeable tour of clever botany, it is a plea for humanity to pay better attention to nature. Fortunately he takes his plea well past mere industrial imitation of natural hardware; he illuminates various follies of techno-society in a way that is hard to ignore. I always regard books of this sort as presents. It's pleasing that someone thought that it would be nice to show me all this wonderful stuff. . . .

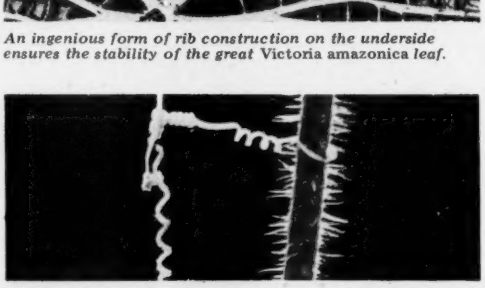
—J. Baldwin

Nature, Mother of Invention
(The Engineering of Plant Life)
Felix R. Paturi
1976; 208 pp.

$10.95 postpaid
from:
Harper & Row General Books
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth



An ingenious form of rib construction on the underside ensures the stability of the great Victoria amazonica *leaf.*



Once the tendrils of the wax gourd have found a hold, as on this wire, they coil themselves exactly like a spring. This makes a firm yet elastic connection.

•

In the flood regions of the Amazon and its tributaries, the water level often rises by several yards. This makes life impossible for ants on the ground, as they would drown every year in their millions. So the ants of those regions have moved into the 'upper storeys' of the forest, secure from flood, and build their nests on trees. They carry earth up, stick it firmly to the trees with their excreta, as with putty, and – expressly in the interests of this unusual nest structure – lay *Bromelia* seeds on it. The plants sprout rapidly, cling to the supporting trees, and lend considerable solidity to the entire edifice. In these gardens, designed and planted by themselves, live the ants. But the *Bromelia* likewise profit from the association, for their gardeners have planted them precisely where they too are secure from floods. Once again it is common adaptation, combined with division of labour, that makes symbiosis a highly advanced form of adaptation to hostile environments.

Analysis of Vertebrate Structure

It isn't often we champion a college textbook, but this one is just plain fascinating. It tells how vertebrate animals work. Of course the usual zoology information is there, but the emphasis is on mechanism. The mechanisms are admirably illustrated and the illustrations are backed by a text that assumes an intelligent but not highly experienced reader. (The author himself says, ". . . I will be pleased if the reader occasionally forgets the forthcoming examination and reads on thinking, 'Wow, that's really something!' "). Just as a hill is more than just a hill after you get into geology, a dog is going to be more than just a dog after you read this. Real education. The book also is a rarity in the textbook field; it is written in a way that reveals the mysteries. Most textbooks subtly hide what they purport to teach, apparently because the authors subconsciously don't want their expert status diluted. Not so here. It could scarcely be more clear.

—J. Baldwin
[Suggested by Kathleen Whitacre]

Analysis of Vertebrate Structure
Milton Hildebrand
1974; 710 pp.

$15.95 postpaid
from:
John Wiley & Sons, Inc.
One Wiley Drive
Somerset, NJ 08873
or Whole Earth

Like the car, which in high gear can move fast but is correspondingly handicapped in climbing grades, the cursorial animal can add further speed only by sacrificing power (work per unit of time). However, although runners do not need great power, like race cars they retain some relatively low gears. For example, Figure 20-10 shows that the semimembranosus, with its relatively long effective lever arm, is a low-gear system relative to the middle gluteus muscle system which has the same action but a much shorter effective lever arm. The animal may use the lower gear to initiate the swing of the femur, and then, like a car driver, shift to the higher gear to speed the action.

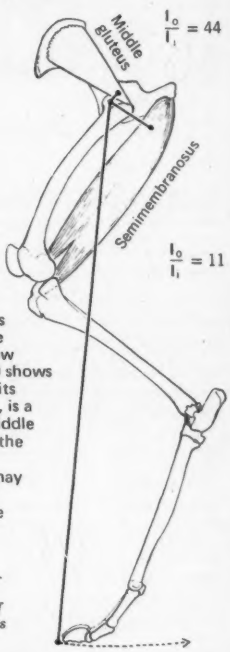


Figure 20-10. High gear and low-gear muscle systems shown by a lateral view of the left hind leg of the vicuna, Vicugna. *The muscles are diagrammatic.*

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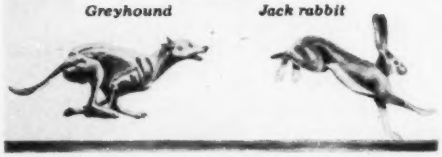


Examples of Mammalian cursors showing flection and extension of spine and legs, passage of hind feet outside forefeet, and varied positions of the shoulder.

FROM URGENCIES TO ESSENTIALS

CANADIAN PRIME MINISTER
PIERRE ELLIOT TRUDEAU

AT THE OPENING OF
THE NEW ALCHEMIST ARK
AT SPRY POINT, PRINCE EDWARD ISLAND

Prime Minister Trudeau

Photographs by Stewart Brand

"Distinguished guests, ladies and gentlemen. Those who are concerned about the future of mankind are haunted by three questions: will there be enough food, will we have enough energy, and can we produce both without destroying the environment; without making the earth a place which is not good to live upon? The Ark – which I have the pleasure of declaring officially open this morning – the Ark is answering "Yes!" to those three questions. And that is why I consider it a very exciting moment.

"Some of us in our jobs are trying to answer the questions of today and tomorrow, and very often, we find that the urgent is replacing the essential. Well, the essential is being talked about here, worked on here, and that is why I believe there is a sense of excitement that is shared by all those who are here today, all those who know about this work. The Indian Chief Seattle used to say that "whatever befalls the earth will befall the sons of the earth." And what is befalling the earth is known to all of us – the high techniques, the high mechanistic civilization which we have developed has produced great abundance, great affluence, but it is also destroying the earth – destroying the rivers and the streams, fouling the air and the land, destroying the landscape, and even the mighty oceans are endangered. And as we know, when the oceans are dead, the planet will be dead.

"On those questions – the questions of how to build our techniques into a technology; how to insure that the machines we have created – those wonderful machines; each one in itself, whether it be an automobile, helicopter, a modern house or a ship, or a petroleum-burning machine – all these things are great creations of the human brain. But we have not yet, as mankind, built a philosophy of those machines. And this is what is being done here in a practical way.

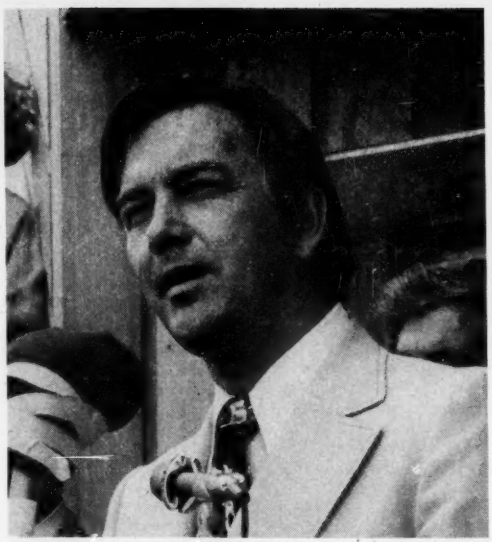
Canada now leads the world in the encouragement of soft technology research. And Canada's smallest province, Prince Edward Island, leads the world in discouragement of nuclear energy. Last year P.E.I.'s young premier (38) Alex Campbell, with the citizenry concurring, simultaneously banned the development of nuclear energy in the province and gave to The New Alchemists 137 acres of prime coastal land – Spry Point – for research in energy and food-producing alternatives.

From Prime Minister Trudeau's federal government came $354,000 for construction of "The Ark" – a soft technologist's wet dream, a single facility to research:

1) *Solar architecture*
2) *Solar collection*
3) *Heat storage*
4) *Mist propagation horticulture*
5) *Aquaculture*
6) *"Hydrowind" electrical generation*
7) *The integration of all these into an organic and economic whole.*

The participation by Trudeau in the opening of The Ark on September 21, 1976, was the climax of a year of building and weeks of frantic finishing (joined by CQ Soft Tech editor J. Baldwin). The Ark was completed on schedule. The Prime Minister spoke with far more than ceremonial perception.

After his talk I asked the PM if he had any measure of the governmental popularity of this sort of activity. Said Trudeau, "I have no problem finding money for this sort of



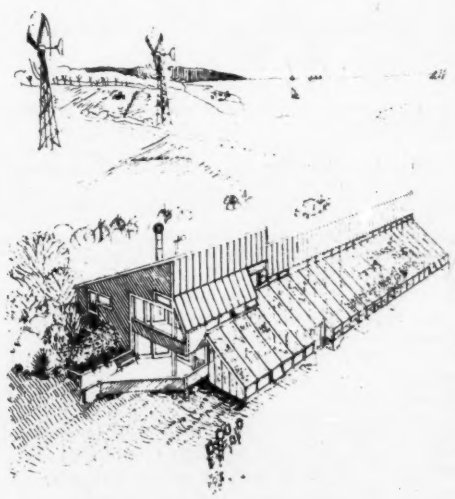
Premier Alex Campbell

John Todd, New Alchemists' spokesman

As Dr. Todd reminded us, there is perhaps no more natural place to be doing that than Prince Edward Island – where agriculture, where fisheries are so important to the livelihood of the people; where a sense of community prevails, and particularly, an island which has proven receptive to new ideas.

"More than one hundred years ago, the idea of confederation was developed here, and now I like to think that this island, which has shown hospitality to this political idea which created Canada, is now providing hospitality to a new commitment: a commitment that environmentalists refer to – and I think it's a beautiful phrase – as "living lightly on the earth." I like to think that Prince Edward Island, the experience of the Ark, and all those connected with it, will be at the birth of this new commitment, of the new philosophy which we will be able then to call a technology.

"I want to express my appreciation for having been invited here. I want to thank all those who are associated with the project: the Federal Department of the Environment, the Federal Department of Urban Affairs, the government of Prince Edward Island which has cooperated in so many ways, but especially Dr. Todd and all those who are working with him here. I think this is a very important moment in the history of our country, and I am very happy to be associated with it." ■



The Ark as designed by Solsearch architects

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project. The problem is finding the people to use it well." He nodded at the Ark. "How many groups do you know who could do that?" I was shocked at the question and my answer – "Uh. Maybe four, maybe five groups." He went on, "I should ask you, where are people with the skills going to come from?"

Ever a sucker for politicians with questions, I shortly found myself urging The New Alchemists that they start a training program.

I'm not sure it needs to be said, but the opening of the Ark was in fact a moving – even triumphant – occasion. Such events usually aren't. This was. Like fiddle music for dancing.

–Stewart Brand

ISS
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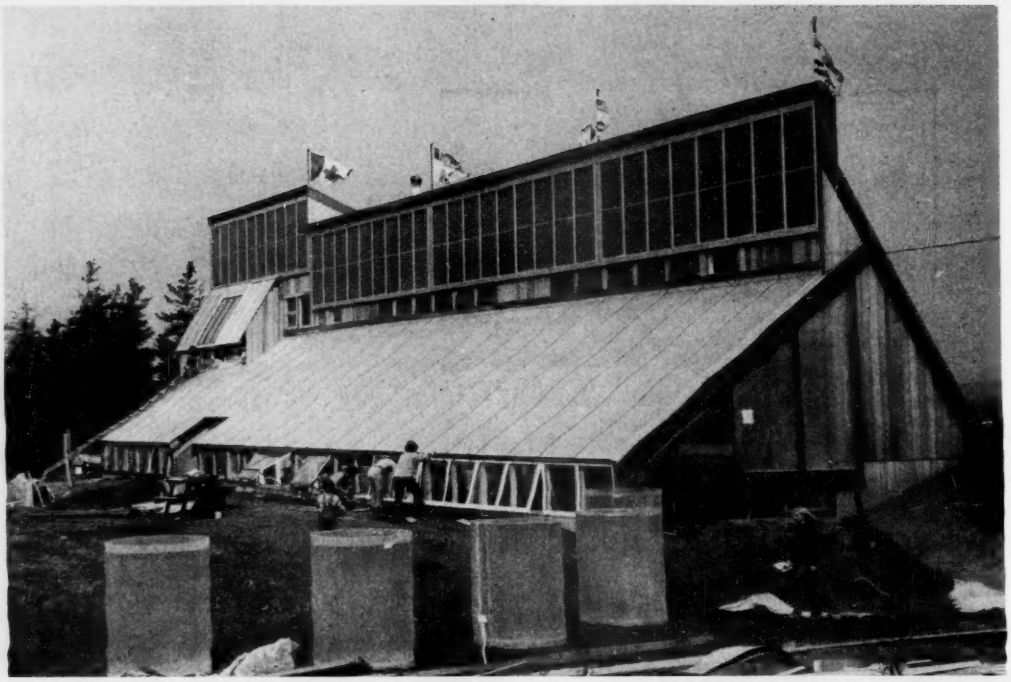


The Ark one day before opening – frantic painting, cleaning, finishing.

SOLAR COLLECTION – Three different kinds of solar collectors are being monitored, tested, and evaluated under rugged Prince Edward Island coastal conditions. The vertical panels are flat plate drain-down type, selective black absorber, solar heat collectors. The sun warmed water is stored in chambers totalling 21,000 gallons under the living room for later use in a fan coil heating system. The angled solar panels at the far end are for domestic hot water heating. The wide slanting roof over the greenhouse is made of a long-lived twin skin acrylic material which acts as a transparent insulation – letting in light while retarding heat loss from the structure to the atmosphere.

The New Alchemists are neither magicians nor geniuses. They are hard workers.

by J. Baldwin

CQ *Soft Tech editor J. Baldwin and Kathleen Whitacre were invited by the New Alchemists to come to Prince Edward Island to assist in the finishing of the Ark in time for the visit from the Prime Minister, and also to get acquainted after all the years of mutual hearsay.*

–SB

September 11

After 20 hours on various aircraft, we land on Prince Edward Island (P.E.I. as the Canadians call it) and are informed only then that it will be a 2-1/2 hour bus ride to the airport where we were supposed to land. We hope the New Alchemists know that. They don't; when we get to Charlottetown airport there isn't anyone there to meet us and it's getting dark. Blowing up rain too. And we haven't had anything to eat all day because the several airline schedules neatly avoided the necessity of feeding us. We don't have a phone number for the Ark either. We trudge out to the road and commence hitchhiking in what we hope is the proper direction, but nobody is biting at night. We're just about to set up camp in a weedfield at the edge of the runway when a car stops. Old man going home from work. He hasn't heard of the Ark, but he says he'll take us to it, about 60 miles, for $15.00. "Sold," we say, and we're off after picking up his wife for the ride.

At Souris, the Ark's mailing address, we ask some teenage boys where it is. They've heard of it, but suppose the police would have exact directions. Kathl tries the Mountie barracks and gets directions from a Mountie who has been there and who is very impressed by the place. We enter a 15-mile maze of back country roads at midnight. Our driver is disgruntled by the complications. We have to ask directions again but finally spot lights that just have to be the Ark, and we're there at last. But the place is locked up. Nobody answers our beating on the door. We pay our driver and he takes off leaving us standing there disconsolately in the rain. We jimmy a window and throw our stuff in along with ourselves and creep upstairs amidst an astounding array of pipes, tanks, ladders, scaffolds, plastic panels, wiring, wet

UMI

The Prime Minister greets P.E.I. locals, press, and New Alchemy staff and friends, who greet him back. Trudeau-mania lives.

paint, blowers, lumber and glass. It looks like a plane crash. As we climb an unfinished staircase, we see feet coming down the stairs above us. "Who's there?" "Jay and Kathleen." "We didn't expect you until tomorrow."

In minutes we're over at a neighboring house where everyone else is eating like hogs and washing it down with a variety of liquids including something called "Lambs" which turns out to be 151 proof rum. (Egad!) The room is packed with tired but happy people happily roaring at each other about what they've been doing that day and hope to do tomorrow. Names are exchanged, but it's hopeless. We eat two loaves of bread, a pound of cheese, some borscht, and join the exodus to "upstairs" where we all sleeping bag it up. 3:30 a.m.

September 12

We wake to find everyone gone to work. They've let us sleep in. We stuff in some breakfast and take John Todd's truck over to the Ark and are greeted by a swirling uproar of people all working like mad. In addition to the New Alchemists we'd met the night before, there are a number of local craftsmen, farmers, and passersby carrying things back and forth. I am a bit worried about fitting in, but John Todd soon settles the problem. I am put to work fitting lids onto fish tanks and Kathleen commences fitting shelving into closets – much to the amazement of the local carpenters. We begin to see the picture: people are doing what has to be done. The organization is lateral. John is not in charge, despite the fact that he is most often the spokesman for the Alchemists. Ole and David (last names we never did learn) are in charge if anyone is. It turns out that they are the Ark's architects turned contractors – and carpenters when they feared (probably rightly) that the Ark might not get done right if contracted out to strangers. Their care shows in the detailing, and they know what has to be done.

I am frankly appalled at the amount of work that must be accomplished to meet the deadline of the Prime Minister's visit, which is a Big Deal. John is serving as a lubricator, whizzing around ordering materials and seeing to it that trips to town are arranged efficiently. He is also arranging for the P.M.'s visit. Lots of politics. It's a good thing John is Canadian. The P.E.I. people are an independent lot, and don't seem especially fond of Americans, though they are cordial enough. The local tradesmen work more deliberately than the Americans, but the total effect is still pandemonium because there are so many working. Few orders are passed. It's pretty obvious what isn't finished.

The ladies are mostly involved preparing the garden and painting things. There are overtones of male chauvinist job allotment, but generally things seem pretty good. There are

In the living area of the Ark, the kitchen has an herb garden and a family food garden where vegetables can be grown year-round for the residents. Its climate can be regulated independently from the commercial greenhouse component visible behind Michaela Walsh, who was on hand from the Rockefeller Brothers Foundation.

a lot of kids around, and you can tell a lot about people from the kids. These are all exceptionally beautiful. Five-year-old Eric can read with adult skill and is holding forth from **Lord of The Rings** in a loud voice. He also has a thing about water faucets and causes a 300 gallon flood by twiddling the wrong knob. Oh well. . . .

September 13

Excitement. The Hydrowind generator is going up today. Vince is beside himself with anxiety. It's his day. He quit a good job at Piper Aircraft to do this. A crane comes from a nearby church steeple job and preparations are made all day for the lift. At sundown it goes up easily though with a heart-stopping scare when the huge counterweight comes off the crane. Beautiful. These people work well together. It all has gone smoothly.

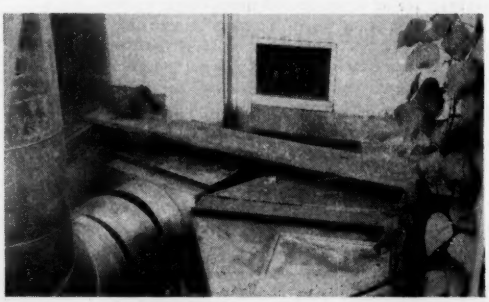
September 15

Things are now as routine as they are likely to be. Everyone is doing their specialty. I'm not making fishtank covers anymore. They didn't fit, embarrassingly enough for me, because the unevenness of the floor made them somewhat oval instead of round. Higher priority is to get all the tanks installed and filled, all 32 of them. I commence working on that and start a sideline of untangling the undisciplined 450 lb. crate of greenhouse vent window opening devices that arrived without instructions for installation. Installing the mechanisms requires me to work with some of the local pipefitters and electricians, which I have been looking forward to. They've been watching us to see if we work. When we do, they are more familiar. I kneel to suck on a hose to start a siphon into a fishtank. "Hey there, when you've done with that one, I have another up here for you," calls a local master carpenter. On-the-job humour is the same everywhere I think.

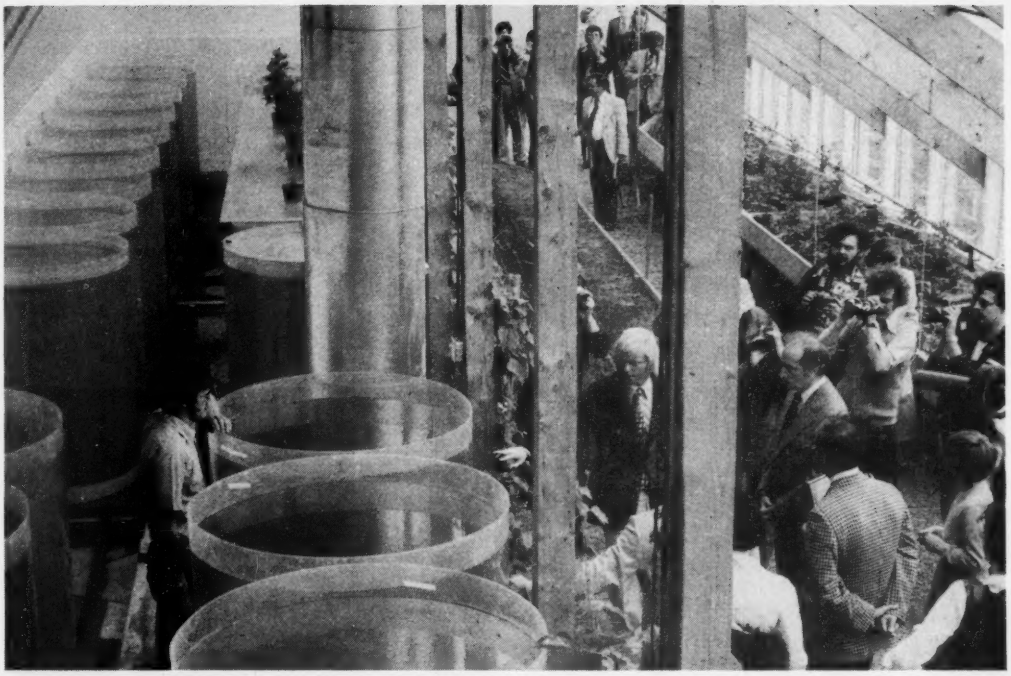
The Hydrowind won't start in considerable breezes and there is a lot of discussion as to why. The consensus is that Vince didn't want any disasters and so set the blade angle of attack too conservatively. He is preparing to make some adjustments. John says, "I want that thing roaring for Trudeau." The machine looks good though. Kathleen has been making little housings for the controls and getting to know the wind machine crew a bit. The machine is several hundred yards from the house so we don't get to talk with them much. John Todd is making signs explaining everything about the Ark so visitors won't ask so many questions. There is a lot of local curiosity, and consequently a steady stream of visitors, all of whom must be treated politely. I am amazed at the high level of questions asked, and also by the hope and excitement showing in the eyes of many visitors. Many offer to help, and if they have something we can use, they are put to work. Tractors arrive to finish the landscaping. A hump rather like a wave is formed on the north side of the Ark both to hide the stark hugeness of the Ark and to deflect wind over it. The tractor operators confide that the pond formed by borrowing dirt to make the deflector hump "just happened to be official hockey rink size. . . ." The Canadian national pastime.

September 17

The days and nights have melted together. Many more Alchemists and friends have appeared and are put to work. After dark on the 19th shouts from the sea indicate that Stewart has arrived by tiny sailboat from Cape Breton, a feat of considerable seamanship. A tent colony is organized out near the Hydrowind which is now turning slowly in the endless breeze. The place is like a kicked-over anthill. P.E.I.'s Premier Alex Campbell (rather like a governor in the U.S.) comes by to make sure that all will be in readiness and not be an embarrassment. He accepts John's assurances, but you can tell that he isn't convinced. The entire Ark and surrounding area is getting worse-looking by the hour. Huge piles of junk appear as the interior is being finished up. Wet paint is everywhere. I see a woman with freshpaint yellow blotches on her bottom, and I know that somewhere there is a closet door that will have to be retouched. The entire plumbing crew packs up and leaves without a word and with much critical plumbing undone. Nobody knows if they're coming back or when. Cleanup crews are throwing out uninstalled (and irreplaceable) parts of things by mistake and I lose 35 brackets that hold windows open and shut. (Never found them either.) Tempers are frayed as there are more workers than there are tools to work with and everyone has a sense of responsibility to get their little part finished on time. "Where's that fucking hammer?" The local people seem unperturbed, but agree to work at night too. Their families show up to see what's keeping Daddy, adding to the mob scene.



HOT AIR ROCK STORAGE – Hot air is blown from the top of the greenhouse into a 118-cubic yard rock storage chamber. The rocks pick up heat and cooled air is exhausted. At night or during cloudy periods the rocks give up their heat and warm the greenhouse.



John Todd explaining the aquaculture ponds to Trudeau and press. This commercial greenhouse and aquaculture area is the heart of the Ark.

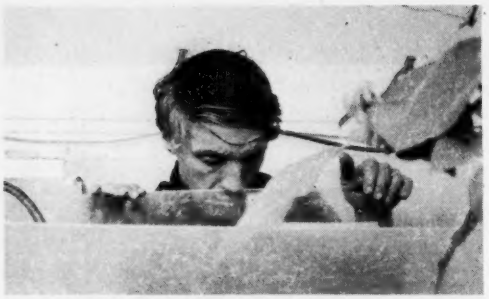
SOLAR-ALGAE PONDS – Made of thin fiberglass which allows more than 90% of the light to enter, they are ideal for growing algae and fish. Further, the algae act as absorbers of solar energy causing the tanks to warm and act as low temperature "furnaces" warming the greenhouse. They are an example of the value of integrating biotic and structural elements. Unlike most fish culture, the Ark's closed systems use light as their primary energy source providing both heat and oxygen. At night when oxygen sensors detect low oxygen levels in the water, additional oxygen will be added from an air compressor which also circulates water between tanks. Up to 20,000 fish – tilapia – can be raised within the Ark at a time. In the future fresh water fishes and crustacea native to eastern North America and tolerant of sun-warmed water will be cultured along with the tilapia.

Kathl and I are working together now for a change and are really cracking along like old times. We're putting in the hot air vents at the top of the greenhouse, working balanced on a very sleazy scaffold, as are the electricians and carpenters. There are close calls. Those fishtanks are 20 feet below us and their rims are only 1/16 inch thick. We are careful but we are also tired. The food situation has deteriorated and nobody is eating well. The vents are sticking in their openings. We foresee that there will be trouble from that source as the Ark ages. Sealing all the windows and vents will be a major problem. We are installing vents with wet paint on them. No time to do otherwise. Paint everywhere. We haven't washed up in more than a week as the plumbing isn't in operation yet. At 10 p.m. we go off with a couple of other American volunteer workers to get a shower at a nearby campground. When they find out we're from the Ark they won't take our money.

September 20

One day to go, and the place looks worse than it has so far! John, Nancy Willits, Ole and David have been doing the 24-hour bit and look it. Wet paint everywhere. Nancy and Jack Todd want everyone out so she can decorate the place with her crew, but the rug men are in the way and the wiring isn't in yet. The place is absolute mayhem. Everyone is in a hurry. There are actual collisions. The kids are ordered from the building. I invade the shop with the final fishtanks and squeeze it down to a 15 foot square. One bursts. 500 gallons on the floor! Pumps are hurried to the scene. Visitors won't even come in the doorway because of the confusion and the very high energy vibe. We knock off for a few hours, but can't sleep and are soon back on the job. A helicopter fraps by to check the landing site. Locals appear with a huge tent and literally thousands of sandwiches made by neighbors so the reception will "speak well of the people from Little Pond." Frantic scrubbing and touchup going on inside the Ark. A farmer arrives with a tractor and proceeds to bury the huge pile of construction junk. One hour to go and we split to our tent to clean up a little.

When we return the Ark looks like something from another planet. Spotless! Flowers everywhere inside. Fresh fruit. John and his crew have planted trees all over the place! Some crew has laid out hundreds of feet of neat gravel paths



J. Baldwin – the Kilroy of soft tech, who has been nearly everywhere – filling solar ponds.

in the mud. The Clivus Multrum toilets smell sweet as clover. The indoor farm-gardens are alive with little sprouts. There are Talapia swimming around in one of the tanks. The whole place glitters in the morning sun. A beautiful day in the midst of a rainy season. A fresh wind comes up and the Hydrowind whizzes, actually making power for the first time. The Prime Minister alights from his Huey. He has with him the Premier (whose cooperation made the Ark happen) and an aide, and the chopper pilot. No cops or secret service at all! Not a gun in sight. (There is a cop in the parking area to direct visitors away from the mud pits and keep all cars a quarter mile from the Ark.) Hundreds of P.E.I. people swarm across the field and gather to hear the speeches. The speeches actually have content! People nod. There's hope in all this crazy stuff. If it works, it'll be good for all of P.E.I., and that's not all of it either. . . .

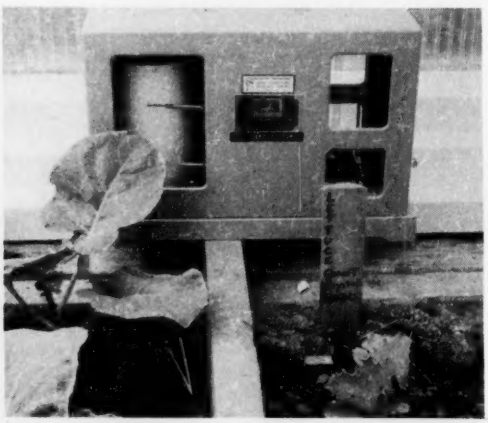
Mr. Trudeau is shown around, and it is clear that he is impressed. He says that there is lots of money for such projects, but a great shortage of worthy projects and people able to run them to completion. He remarks casually if it is possible that the universities are not doing all they might?

While he is getting the tour, an old man climbs up to the microphone and begins to sing a sea chanty in a thin quavering voice. He's good too. He's followed by a fiddler or two and a lady who sings of sailors lost at sea and terrible storms. "You gonna sing your song for us Ed?" "Why, I might at that," and he does. We've never seen anything like this. Anyone who wants to perform does. The sandwiches are devoured by one and all. The Prime Minister leaves and his Huey knocks the kids down with the wind blast. (They love it.) Everyone is exhausted, proud and happy and there is a very good feeling in the air. The local people refer to the project as "our Ark."

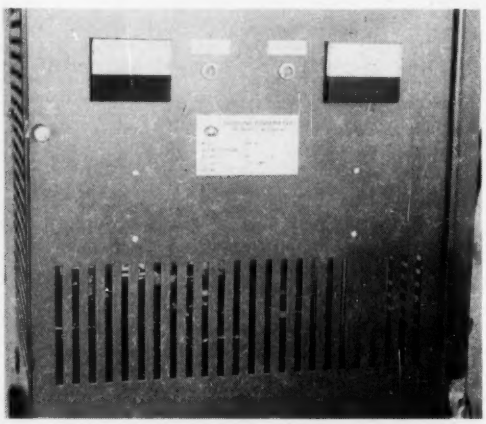
So the Ark is buttoned up for winter. The official opening was just an excuse to get it on line before the snows. The local people stay into the wee hours of the morning drinking and making music. The Premier returns and whoops it up too. Kathl and I just make it to the plane with an Alpha Romeo 90 mph in the rain with one minute to spare.

We didn't talk much on the way home. We were pretty tired and I had a tooth abcess acting up. But after things calmed down a bit we found that we'd noticed similar things. One is the remarkable harmony that people manage to achieve when they all want to see something happen. The New Alchemists also are probably wise in not living together. When there is high work pressure, people need to be by themselves to cool down. People also need to be able to take time for their own projects without feeling guilty.

We were very pleased to see the Canadian attitude towards the Ark. It was by no means unanimous (one newspaper reporter referred to the Ark as American millionaires spending a million dollars of Canadian money) but generally people saw it as a needed experiment and not as a political payoff scheme. Obviously, the Canadians responsible for getting the New Alchemists the money have good vision. No USA grants were forthcoming, though perhaps now there may be some. I was impressed that the Canadian officials saw clearly that the Ark was not merely a building but rather was a way of raising food and trees. It's more of an attitude than an object. That attitude also shows that John Todd and the other front people for the New Alchemists have been doing a fine job of communication.



VEGETABLE CULTURE – Leaf crops, tomatoes, and cucumbers will be evaluated as commercial crops in the Ark. Straw bale, deep earth bed, and hydroponic techniques of raising foods will be researched and compared.



The Gemini inverter which took electricity from the Hydrowind (see next page) and fed it into the P.E.I. power net on opening day – "running the meter backwards." The man from the power company advised, "Let me know before you do that again. Your electricity has too much noise in it still."

Nancy Jack Todd in the living area, which has three bedrooms, kitchen, dining and living room, and a research laboratory office.

But the main thing we felt working with all those people was a feeling of potency. The Alchemists don't subscribe to being helpless and dependent. One way or another, the work that clearly needs to be done gets done. In these days of doom and despair it's a real pleasure to see people putting everything they have into such projects. You're not going to see corporations or governments attempting Arks. Studies maybe, and possibly show-off hardware now and then. But not entire integral schemes like the Ark. I guess we're writing this diary to try and explain that when you see photographs of the Ark all finished and shining, it was built by just plain folks who did their homework and then executed what they found was worth a try. No mystery, just a lot of hard work by people who are willing to take chances and set aside their personal concerns long enough to make something really good happen. We're glad we went. ■

MONITORING – The metabolism and productivity of the solar algae ponds are continuously monitored and the data transmitted to the laboratory – oxygen, pH, ammonia, light, and temperature.

MIST PROPAGATION – The bench mist propagation system, which prevents cuttings from drying out and dying, will be used to root thousands of fruit and nut tree cuttings. The trees will be planted in New Alchemy's experimental food forests and made available to local farms for testing.

HYDROWIND – Hydrowind is the first windmill to use hydraulics to transfer power from the blades to the electrical generating plant on the platform. Hydraulics are also used to match blade pitch to wind speed. During storms the blades are in full feather position. Later this year four Hydrowinds will be connected via a single power station here to the island's utility network. A synchronous inverter will match the mills with the grid.

New Alchemy kids revelling in the take-off blast of a helicopter checking the landing site for the Prime Minister.

It seemed appropriate (that word!) to arrive at Spry Point by non-fossil-fuel means, so I sailed The Evening Star from Nova Scotia. She's an 18-foot gaff-rigged sloop with tarred canvas sails, manila lines, and sufficient seaworthiness to handle the 50-mile open ocean passage without trouble. She used to belong to John Todd.

–SB

PRINCE EDWARD ISLAND ARK

Overall Budget: $354,000

Unofficial Estimated Expenses
1 December 1974 – 1 October 1976

Staff (5)	$ 38,000
Preliminary design	1,500
Architects, engineers, consultants, and support science staff	57,000
Plant – all systems and labor	105,500
Hydrowind development and construction	64,000
Biological and climatological equipment (Province provided weather station)	3,400
Administration, phone, services	8,200
Travel	15,800
Total	$293,400

The Journal of The New Alchemists can be ordered from Box 432, Woods Hole, MA 02543. Volume 1 costs $4. Volume 2 (with "The Compleat Backyard Fish Farmer") costs $6. Volume 3 (brand new) costs $6.

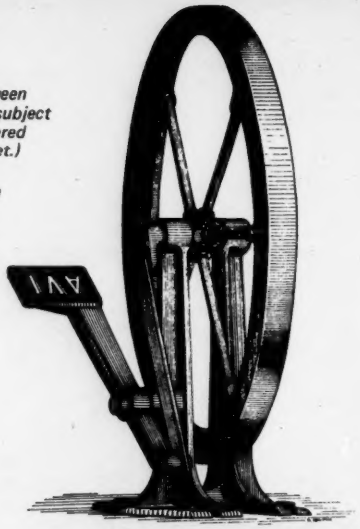
Membership in New Alchemy Institute, a nice way to support it, costs $25. ■

American Village Institute

Village attitude and scale may well be the sought-after middle ground between commune and city. This outfit is attempting to lead the way and give the subject a modern definition. They are paying their way selling foot and handpowered hardware of a sort not seen for many years. (I haven't actually seen any yet.) Their newsletter and catalog make good mind-stirring reading.

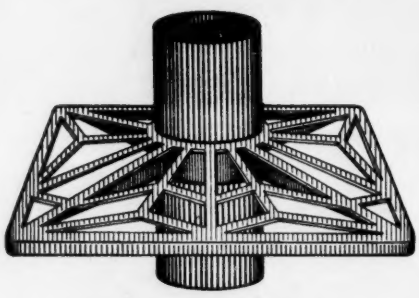
—J. Baldwin

American Village Institute
Catalog
$2.00 /year
Subscription membership
$7.00 /year
(includes catalog)
from:
American Village Institute
Route 3, Box 3486
Selah, WA 98942

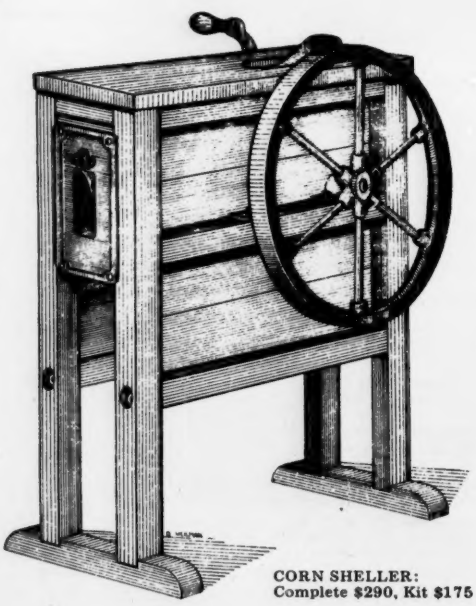


TREADLE POWER: Complete $75

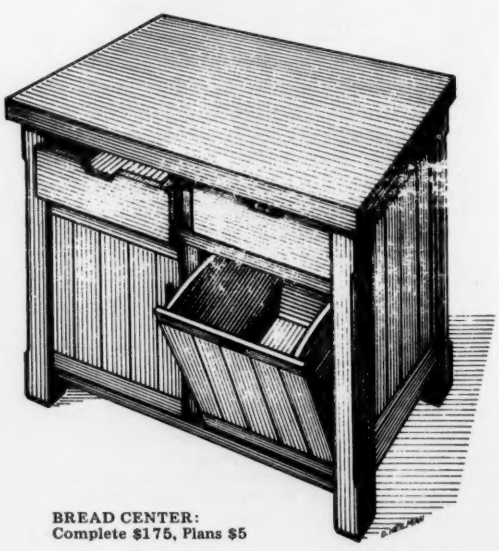
FARM & SHOP CART: Kit $70



STOVE-PIPE SHELF: Complete $16



CORN SHELLER:
Complete $290, Kit $175

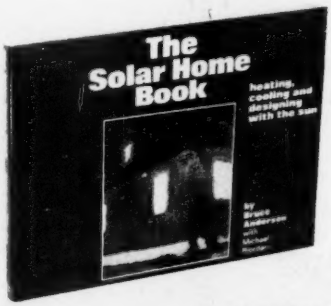


BREAD CENTER:
Complete $175, Plans $5

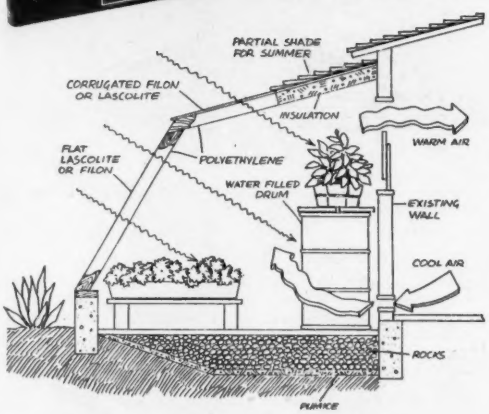
The Solar Home Book

Most of the basic information on solar energy has been established and published in every imaginable nuance, but application of the basics surges ahead so fast that usually only the journals can keep up. Unfortunately, the journals can't afford to be highly detailed, and the hardcover publishers can't afford to bring out new titles. Once again Bruce Anderson and friends come to the rescue, and once again they are in front of the pack. This book is a thorough revision and update of the very fine and friendly **Solar Energy and Shelter Design** *(Spring, '75 CQ). There's a lot in it about "passive" systems (when the building itself rather than a fancy mechanism does the capturing and storing of energy). The whole book is rich in what-we-have-learned-by-trying-it, and gives examples from many different parts of the U.S.A. This is in marked contrast to most others. If you are dealing sun these days, the book is essential reading. (Incidentally, Bruce Anderson is also executive editor of the ever-better* **Solar-Age** *magazine, Summer '76 CQ.)*

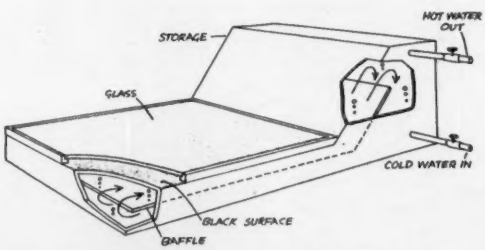
—J. Baldwin



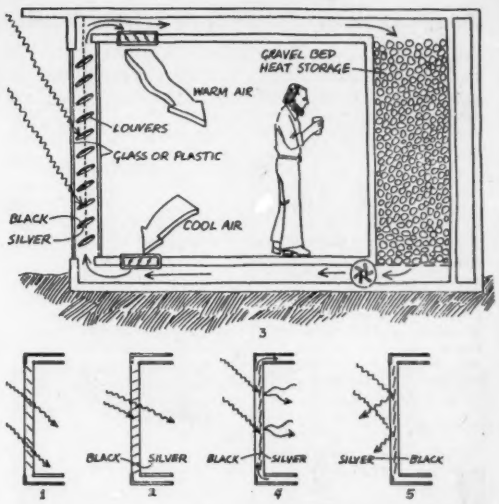
The Solar Home Book
Bruce Anderson with Michael Riordan
1976; 256 pp.
$7.50 postpaid
from:
Cheshire Books
Church Hill
Harrisville, NH 03450
or Whole Earth



Cross section of Solar Sustenance Project greenhouse — daytime operation.



Thermosiphoning solar water heater developed in the West Indies.



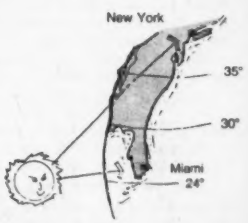
A "Venetian blind" solar collector and heat control device — various operating modes.

A Floridian's Guide To Solar Energy

I usually opt for the general-principles information, but Rich Merrill, stoutly holding forth on the merits of regional expertise, flapped this book in my face and made me an instant convert. Oh, the basic general principles are here, too, but there is also a lot that only applies to Florida or Florida-like situations. And rightly so; in Florida it really tells you what you need to know. In the rest of the country, it tells you what the book for your area should be like when and if it appears. This book is a fine example of what can be done to bring solar energy to the people, and it's the sort of thing for which State $ can and should be used. A great bargain at the price too!

—J. Baldwin
[Suggested by Richard Merrill]

A Floridian's Guide To Solar Energy
State Energy Office Data Collection & Analysis Section
1975; 120 pp.
$1.50 postpaid
from:
Florida Solar Energy Center
300 State Road 401
Cape Canaveral, FL 32920



Sizing of Components:

1. Collectors: the square footage of flat plate collectors needed is dependent upon floor space to be heated, type of insulation used in the building, amount of air infiltration anticipated, and other parameters that would contribute to heat loss from the building. In northern Florida, 1 square ft. of collector area per 3 square ft. of heated space in conjunction with adequate storage would provide 100% of the heating requirement. For example, a 1500 sq. ft. house would require 500 sq. ft. of collector area. It is important to note that it may not be economically feasible to have a solar heating system provide 100% of the heating requirements; this requires an economic analysis to determine feasibility. In most of South Florida one would not normally consider just a solar space heating system alone since it would be hard to economically justify because of the low heating requirements.

RAIN (Journal of Appropriate Technology)

Dear Stewart, Andrea, et al C-Q,

I guess I just don't understand. You seem to be ignoring us, our work – **RAIN**, and now it begins to feel intentional. This is what I feel and I'd like to 1) open the dialogue as to why and 2) persuade you to acknowledge us and work with us beyond mailing list exchanges. . . .

–Lee Johnson

•

Good Lord, Lee, everyone here thought we'd reviewed **RAIN** *long ago and enthusiastically – I swear I can see it on the page – but none of us can find it. To set matters straight, we use* **RAIN** *all the time as a research source, I consider your reviews usually better than ours, we feel comforting commonality with* **RAIN** *and praise it to our friends and our strangers, and I'll say as much in the Winter '76* **CQ**. *Your poster's on a wall in the Gov's office. We admire your solar workshops. And I know how you feel about apparent conspiracies of silence.* **RAIN** *is good enough to be taken for granted, is what happened.*

–*Stewart*

RAIN
(Journal of
Appropriate Technology)
$10.00 /year
(10 issues)
from:
Rain Magazine
2270 N.W. Irving
Portland, OR 97210

The Improved Nut Trees of North America, Clarence A. Reed and John Davidson, 1954, $10 from:
Devin-Adair Co.
1 Park Ave.
Old Greenwich, CT 06870

When you are ready to go nuts, this book gives a practical guide. Covers walnuts, beech, hickory, pecan, chestnut, oak, filbert, and more specialized nut trees – choice of species, propagation and culture of nut trees, causes of damage to trees, development and filling of nuts, and a list of nut nurseries.

•

Energy Essays, by Malcolm Wells, 70 pp., illus., $5.95 from:
Edmund Scientific
150 Edscorp Bldg.
Barrington, NJ 08007

If you liked Steve Baer's **Sunspots**, you'll love these "hey, what'd he say" perspectives on such 3rd planet from Sol topics as: air, water, food, waste management, solar energy, miracles and energy-smugness. And you'll be glad Gutenburg did it. Dave Deppen says his favorites start on p. 9, 11, 27, 43, 47, 63 and 65. Malcolm is the architect who may know the most in the world about underground energy-conserving houses and who brought us the "Wilderness Graph," suggesting man's works ought to at least do as well as a forest (p. 55).

•

A Naturally Air-Conditioned Building, Harold Hay, $1.00 plus stamped, large self-addressed envelope from:
Skytherm Processes & Engineering
2424 Wilshire Blvd
Los Angeles, CA 90057

Introduction to the "water-bed roof for thermal mass" concept, which heats and cools the Hay-designed Atascadero, California, home.

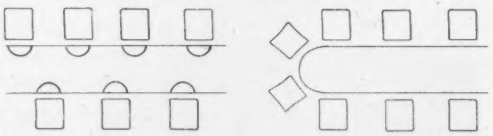
Total Home Protection

Something we don't like to think about. Total home protection is what follows total paranoia. On the other hand, burglary is drastically on the rise, and it's pretty dumb to get caught by fire. This book tends towards expensive hardware solutions to just about every sort of threat your humble abode may be subject to, but passive techniques are covered as well. In happy contrast to other books of this type, horror stories are avoided. The information is presented in a just-the-facts-ma'am tone of voice that also makes recommendations. If you're feeling insecure in your livingroom this book is a good place to find out what to do about it.

–*J. Baldwin*

Total Home Protection
Curt Miller
1976; 117 pp.
$4.95 postpaid

from:
Structures Publishing Co.
P.O. Box 423
Farmington, MI 48024
or Whole Earth



Shaded areas represent effective defensible space. In left diagram, homeowners do not feel much responsibility for cars or people passing by because they may be going on to the next block, or through to the other side of town. In right diagram, street dead ends. Each homeowner feels responsible for the actions that take place on his block. Defensible space extends through the entire area.

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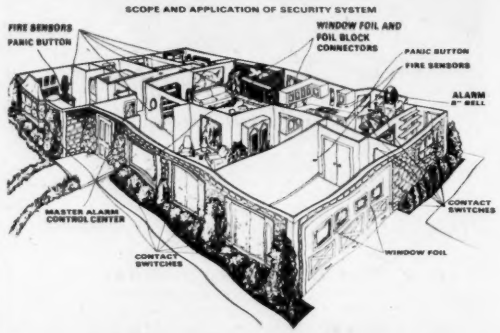
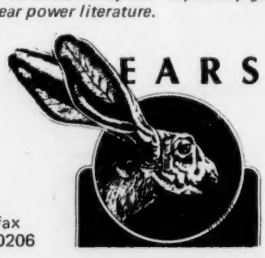


You can connect any number or type of sensors to this Archer alarm system, available from Radio Shack. Unit features choice of instant or delay modes, as well as an automatic reset after two to two and a half minutes. One of the lowest-priced alarms available, it sells for $29.95.

EARS

Environmental Action Reprint Service has a nice catalog of books, films, plans, even bumper stickers, having to do with "alternative" energy and related subjects. Especially good selection of anti-nuclear power literature.

–*J. Baldwin*



EARS
Catalog
free
from:
EARS
2239 East Colfax
Denver, CO 80206

Gaudi

Expensive coffee table books don't interest us very often because they tend to be mostly fluff. This one is mostly rock. Gaudi is being "rediscovered" by many persons who are fed up with glittery aluminum and glass modern styles. His work shows a bold imagination and a remarkable variety of form and color. Yet he based his designs on meticulous discipline and structural analysis. He didn't write much, but the author spent many years in his studio, so there is ample anecdote and discussion of theories. Needless to say at this price, the book is well illustrated, complete, and annotated to a fare-thee-well. All his work is displayed, much of it for the first time in print, so even Gaudi lovers will find a lot here. Usual MIT Press quality. This book surpasses Antoni Gaudi *(CATALOG, p. 85).*

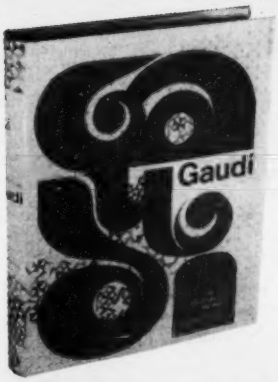
—J. Baldwin

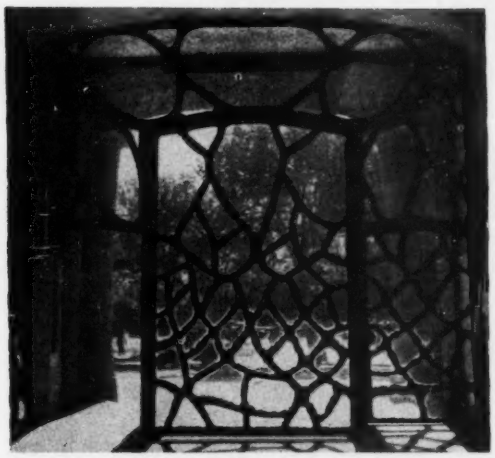
Gaudi made a distinction between *fantasy* which is born of a deformed reality and peopled by ghosts, and *imagination* which is the product of real images, and he considered the two terms to be contradictory. Those who wish to praise the master — as many do — by attributing to him great fantasy, actually insult him in his own terminology.

•

Hexagonal floor tiles with reliefs alluding to the Earth, the Sea, and the Heavens.

Gaudi: His Life, His Theories, His Work
Cesar Martinell
1975; 486 pp.
$50.00 postpaid
from:
The MIT Press
28 Carleton St.
Cambridge, MA 02142





Iron grating of the chamfered corner of the Casa Mila from the interior.

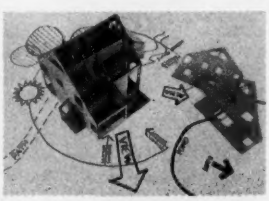
Designing Houses

Though not billed as such, Designing Houses *is a thing-maker's dream book! Even if designing and building your own "big house" is not within your current reach, you can not help being caught up in the enthusiasm generated within. Model making is stressed throughout, starting with the setting up of your own "architect's office," obtaining the instruments and tools of the trade and quite an ample course on cardboard construction. Best of all are the drawings: neat, simple, funky, their inevitable influence on your own sketches makes this handsome volume underpriced . . . now where did I lay my X-acto . . .*

—joe eddy brown

I agree with joe eddy brown that this is an exceptionally fine book. My only reservation is that the presentation subtly tends to keep you traditional, which for many will do just fine anyway.

—J. Baldwin

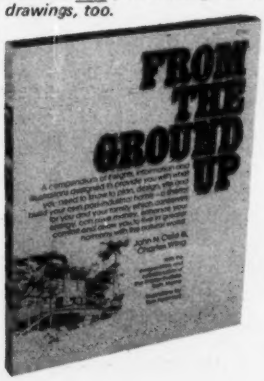


Designing Houses
Les Walker and
Jeff Milstein
1976; 153 pp.
$10.00 postpaid
from:
The Overlook Press
Lewis Hollow Road
Woodstock, NY 12498

From the Ground Up

After the first wave of books on a given subject a host of imitators usually appears offering little improvement other than an occasional gimmick. The gimmick in this book on post-industrial home-building is worth checking out: the authors have included a quickie course in structural principles. They are also good on frost heaving, selection of wood, and other arcana that is very good to know but that is usually left out of similar books. They want you to know why you're being told to do it that way. Nice drawings, too.

—J. Baldwin



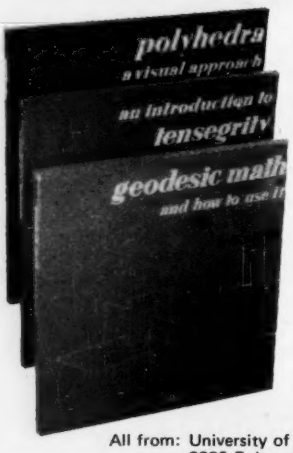
From the Ground Up
John N. Cole and
Charles Wing
1976; 244 pp.
$7.95 postpaid
from:
Little, Brown & Co., Inc.
200 West St.
Waltham, MA 02154
or Whole Earth

Geodesic Math and How to Use It
An Introduction to Tensegrity
Polyhedra, A Visual Approach

These three books are intended to form the foundation of the understanding necessary to mathematically analyze geodesic structures. The authors feel, rightly I think, that dome structures would be much more widely used if architects could reliably calculate them. And an increase in the use of domes would be highly appropriate in these days of ecological awareness as they offer economy of structural material and superior thermal performance.

These books are really good! I've been messing with geodesics for 25 years and have managed to get by (just) with a rather woozy idea of how it all works. A few hours of reading these brilliant explanations has made many aspects of geodesics clear to me for the first time. And without resorting to a computer either. The actual stress analyses are not shown. These books represent the second generation of explorations, and the analyses will be the third. What to do next is made pretty obvious and there is a gleeful invitation for you to be the one who works it out. Anyway, these guys have done a beautiful job of fulfilling a longfelt need. It's a true pleasure to see process celebrated instead of goals.

—J. Baldwin



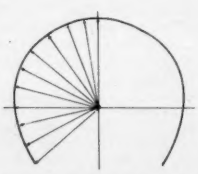
Geodesic Math and How To Use It
Hugh Kenner
1976; 183 pp.
$5.95 postpaid

Polyhedra: A Visual Approach
Anthony Pugh
1976; 128 pp.
$4.95 postpaid

An Introduction to Tensegrity
Anthony Pugh
1976; 135 pp.
$4.95 postpaid

All from: University of California Press
2223 Fulton St., Berkeley, CA 94720
or Whole Earth

Free Forms



It is possible to apply the geodesic three-way grid to any surface that can be mathematically described. The description is not always easy, and one can conceive of convex curves that would give a skilled mathematician trouble. One thing that is simple in spherical coordinates, though, is the notation for any surface of revolution whose profile is a convex curve drawn freehand. Should you want a shape like the one above, you have only to draw it on graph paper, designate an origin point, and from that point run radii out to the curve, the angle of each radius with the vertical axis being one of the θ values for the breakdown you have chosen. Call the length of the vertical axis $r = 1$, and measure the other radii. Then use those radii, and the ϕ, θ values from the table for your breakdown, in Equation 9.1 to get chord factors. The octahedron's 90° seams make it possible to combine two such profiles, left and right. Keep the roofline convex and avoid extended arcs of very low curvature, unless you are prepared to take the structural measures described in Chapter 16.

– Geodesic Math

Fredson Trailer Supply

Working with owner-responsible power sources or attempting to "live small" can be frustrating when it comes to hardware: you either can't find any, or you are stuck with the outrageously expensive yacht equipment that is much overdesigned for land use. A useful compromise can be found in recreational vehicle hardware, but it is often hard to find too, especially in an array that makes a choice possible. This catalog presents an array that makes a choice possible, to say the least. If you've "always wondered where to get one of those" . . . try here.

—J. Baldwin

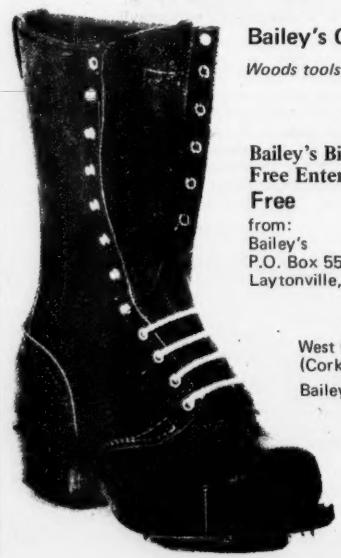
Fredson Trailer Supply
Recreational Vehicle Parts & Accessories
(Catalog)
1976; 163 pp.

Free
from:
Fredson Trailer Supply
815 N. Harbor Blvd.
Santa Ana, CA 92703

HELLSTAR HOT WATER HEATER
For Vans, Campers, Motor Homes, and Boats

The method used to heat the water is a quick recovery heat exchanger running off the vehicle's coolant system. Installation requires the insertion of two "T"s in the heater hose lines to the inlet and outlet fittings of the heat exchanger coil inside hot water tank. The inner tank is all aluminum. Surrounding this tank is 1¼" of fiberglass and foam insulation. The outer shell is of steel construction and has a beige, baked enamel finish. This heater may be installed in conjunction with any hand or electric water pump or selector valve that will withstand the temperature involved.

GENERAL SPECIFICATIONS:
Capacity: 3 gallons either model
Heat exchanger output: 5000 plus BTU's/hr.
Recovery Time: 15 min. to heat from water 60 degrees F to 140 degrees F. Maximum water temperature normally reached – 195 degrees F.
10-1103-00 HW3V Vertical Water Heater (20.0 lbs) $74.95



Bailey's Catalog

Woods tools at attractive prices.

—J. Baldwin

Bailey's Bi-Centennial Free Enterprise Catalog
Free
from:
Bailey's
P.O. Box 550
Laytonville, CA 95454

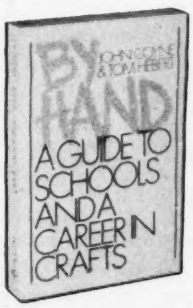
West Coast Calked (Cork) Boots
Bailey's $89.00

Craft

By Hand

Last issue we listed **Getting Skilled,** *which is a guide to trade and technical schools. This book by the same authors is a guide to acquiring an education in crafts. The issue of making a living from crafts isn't dodged either; in fact there is considerable discussion on the subject and a number of interviews with successful craftspeople. The book is a couple years old, so there will likely be a few discrepancies in the course descriptions and comprehensive listings of offerings. That shouldn't deter you from giving it a look though. You'd be hard pressed to get this mass of information together anyplace else.*

—J. Baldwin



By Hand
(A Guide to Schools and a Career in Crafts)
John Coyne & Tom Hebert
1974; 255 pp.
$3.95 postpaid
from:
E.P. Dutton & Co., Inc.
201 Park Ave. South
New York, NY 10003
or Whole Earth

The majority of craftsmen earn a large part of their living by teaching crafts. And many of the well-known craftsmen earn very good livings from lecturing and doing short courses in their field.

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They leave the lights on all night at Penland School of Crafts. They light up the huge three stories of Loom House, the pottery workshop, the forge and glassblowing sheds. The lights are left burning because students work late on their crafts, long after sunset, and sometimes — when a kiln is being opened or the forge is operating — into the daylight itself. . . .

According to Bill Brown, director of Penland, nothing is scheduled but meals; and they are kept on time to the minute. The rest of the day falls into place: classes, lectures, free time. People work the way they want. Nothing is planned and everyone finds his or her pace. People "disappear" into their craft, work in solitude at the potter's wheel, or loom, in silence blowing glass. Conversation becomes something of a waste of time. It's not surprising to find a room of thirty potters silently bent over their turning wheels and not a sound, except perhaps the slap of hands against wet clay.

At meals, however, there's a full house of talk and laughter. The dining room, in a grand old stone-and-wood building, with dormitory rooms on top, and a screened-in porch, fills up with 100 students plus 30 faculty and staff. The dining room has the atmosphere of a kibbutz, that closeness of shared lives. Everyone helps with the meals, keeps the place clean. . . .

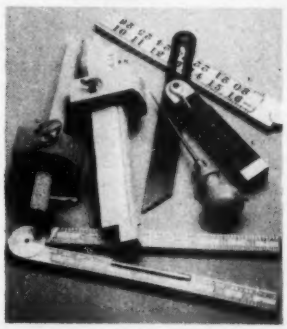
"Penland has the finest faculty of any institution of its type," said Bill Brown. "No other school could afford the salaries of the 350 faculty members we have had here during the last eleven years. We can't afford it either, so we don't pay them. They come for room and board, traveling expenses, plus thirty dollars a week spending money. This year alone we're going to have here in ceramics Don Rietz, Toshiko Takaezu, Bill Barrell and Paulus Berensohn, plus Cynthia Bringle; she and Jane Peiser are our resident potters.

Penland School of Crafts
Penland, North Carolina 28765

Garrett Wade Company

For the livin' end in catalogs of expensive professional woodworking tools take a look at this! The studio color photographs give a good feel of the high quality (though I admit that even Globemaster tools would look good shown in this context). The contrast with your Local Hardware Store is obvious and deadly. I hold such catalogs in high regard not only for their yummy contents, but for their educational value; the accurate descriptions together with the sharp illustrations show what's available and what the tools do, and thus can inspire the craftsperson to assume new responsibilities.

—J. Baldwin



Garrett Wade Company, Inc.
(Catalog)
Free ($1.00 first class. Send them a buck anyway.)
from:
Garrett Wade Co., Inc.
302 Fifth Ave.
New York, NY 10001

Alfa Catalog

The catalog offers "materials, supplies, tools for conservators, craftsmen, laboratories, artists." A lot of the items, albeit of good quality, are widely available elsewhere. For me the catalog's special value lies in its offerings of bonding and fairing compounds. Alfa lists hundreds of such products for many purposes . . . metal foil adhesive, bookbinding adhesive, aluminum fairing compound, cyanoacrylate "super" glues, fabric glues, bronze putty, etc., etc. Alfa also gives formulas for glues and other products you can make up yourself.

—George Cope

Alfa Catalog
$1.00 postpaid
from: Alpha Products, Ventron Corporation
152 Andover St., Danvers, MA 01923

"Archer's" Glue
A plastic mounting medium originally developed for attaching specimen plants to paper mounts. This unique compound adheres to paper but not to the plant or to many other materials. It is typically applied by dispensing a small strip from a thumb-pump oil can. This forms a "plastic string" that lays from the paper over the specimen and back to the paper. Dries to a crystal clear "string"—simply snip string to remove the specimen from the paper. The necessary chemicals are all available in Chemicals Section of this catalog. *A truly unique product.*

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Kerodex No. 71
For Wet Work

A water-repellent barrier hand cream for "wet" work. Blocks skin contact with water and chemical agents dissolved in water. Protects against acid, caustics, plating solutions, cutting oils, dyes and epoxy resins. Works for 3 to 4 hours of usage. Not greasy, invisible. 4 oz. tube $1.95; 1 lb. jar $5.95.

The Acorn People

BY RON JONES

DAY 1

Children spilled from cars and buses. It was an eerie sight. Parents carefully picked children from their perches and placed them in wheel chairs. There was an open-mouthed silence. The woods and paths of Camp Wiggin were accustomed to troops of running feet and the noise of children at play. With these wheel chair children there was only silence. It was as if the woods themselves were watching the unfolding of chairs and lifting of bodies. All life seemed to stop. In procession, the parents wheeled their children toward awaiting counselors. I was a counselor. A target of this pilgrimage. Like everyone around me, I didn't know what to say.

Oh shit. What do you say to a parade of children who move toward you only by the energy of their parents' insistance. Who move toward you with swollen heads of gargantuan proportion. With birth scars that have left the eyes without sight or the body without arms and legs. Children that seem drained of expression. Pulled into convulsions by unseen strings. Pallid in color and spirit. Beings without visible life. Crumpled and stuffed into wheel chairs. Covered with blankets, not to ward off the cold, but the vision of disfigurement.

The nurse of the camp had given us a one day orientation about handicapped children, but to see this mass of injury stunned the brain. There were perhaps one hundred and twenty children in all. They seemed old for their age. I remember the nurse saying, "Most won't live past their teen years. It is nature's way." She described the hydrocephaloid children, with heads that looked like melons about to burst. And the disease of multiple sclerosis which ate away at the muscles leaving the body without energy or movement. The children that would have mongoloid faces and a distant stare. Children with an epileptic chemistry, that might at any moment jerk the body into an unconscious spasm. Children living with an unexplained polio attack that would cruelly freeze in place their legs, leaving the rest of the body and mind to wonder at the reason for this paralysis. And finally the children that entered life without vision or a hand or perhaps a face.

The transfer of children from parent to camp staff was done like a precious stamp being traded by collectors. No sign of real welcome or excitement. The stamp had value but no voice. It was one more exchange. Parents, weary of the drive and the emotion of parting, didn't say much. They paused, mentioned how nice the camp looked, and said goodbye.

Counselors welcomed their new responsibility with an equal degree of decorum. There were two counselors for each cabin of five children. I shared counseling duties with Dominic Cavelli. He was from New York. A tall Italian youth with a slight but strong body. Deep brown eyes that told you of his concern and love for children. A soft manner and a smile that moved across his face whenever he was about to speak.

Dominic was a great story teller. He knew about fine foods, New York restaurant trade, and most exciting of all, he knew about the Mafia. In fact his observation of the Mafia was a picture I had never seen before. It was a syndicate, a family, tied together by etiquette and obligation. In a strange way it was self imposed law and order. The characters were brothers. The cause was brotherhood and living with style. Dominic always threw his hands upward at the mention of his Mafia experience. A bemusing gesture that left you wondering, is it true, or . . ? The vision of Dominic working with children seemed a contradiction. Perhaps it was no more unusual than my own motivation and presence at the camp.

Dominic was after a career working with handicapped children whereas I had placed myself in this position merely for the job. Oh, I rationalized about serving others and compassion for kids, but behind this mask was the motivation to have a good paying job for a

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Another true story from Ron Jones. His "Take As Directed," which we carried in the Spring '76 **CQ**, *became a wire service news item and will be made by Norman Lear (of "Mary Hartman, Mary Hartman") into a Broadway play. (That story was about Ron's fascist takeover of his high school – a class experiment run amok.)*

This account also has a future. It's in two parts. After the second part appears in the next issue – Spring '77 **CQ** *– it will be reprinted (somewhat abridged) in* **Psychology Today**.

Ron's stories are dangerously lived and tellingly written, and, I'm beginning to realize, all have the same moral: Learning begins in impossibility.

–SB

Benny B., Arid (Aaron Gerwalski), Martin, Thomas Stewart, Spider.

few weeks and enjoy summer camp life. I had been a P.E. student and athlete in college. The illusion of playing with kids, swimming all day, and taking long hikes had drawn me to this place. My illusions were quickly clouded and washed away. I wasn't about to frolic with these children. It would be fortunate, I thought, if we could even take a few steps together.

As the children were assembled for cabin assignments, I wondered at this mass of humanity before me. These children with hollowed out faces and nervous twitches. What were they thinking? Did they think? Or even feel? They all looked alike. Boys and girls inseparable by a common hurt. Did they have future hopes? Or was life a dulling repetition of survival? Or worse, some kind of perverted game.

I didn't have time to think. There was work to do. Every movement required a tug and a pull. Just crossing the camp from assembly point to cabin took twenty minutes per child. Some could be pushed. Others had to be carried or patiently guided. Dominic and I, like the other counselors, swept back and forth freighting luggage, children, and the "ditty bag" that would inevitably spill to the ground.

We didn't have any experience at this task, and the camp wasn't set up for this kind of care. Each cabin had three steps. Steps that became hurdles. You can't wheel a chair straight up a set of stairs. I tried with the first kid and spilled him head first. Everything had to be learned. The simplest task was an ordeal.

The camp was divided into two rows of cabins. Boys on one side, girls on the other. At one end of the rows stood the camp bathroom, dining hall, swimming pool and flag pole. The flag pole had a large speaker on it that barked a greeting to all campers and played songs left over from the Boy Scouts that normally inhabited the camp. In the midst of this orchestrated hello, I was silently cursing toilets that didn't have grab bars. No sooner had one kid gotten unpacked and comfortable than it was off to the bathroom. What was a simple and normal act became a trial. Pants had to be pulled over cumbersome braces that grabbed and pinched at anything within reach. I had never changed someone's pants, much less balanced a child on the toilet only to be told in crying sobs that "I don't have to go now!" Back with the pants. Lifting and tugging until at last I realize I'm sitting in the wheel chair and a wet child is now sitting in my lap. It would be humorous once, but this struggle goes on. It covers every minute and every thought. Grating and shredding away any pretense or possibility for even the simplest of interaction. Every move, be it brushing teeth or simply rolling over requires assistance. I feel like a slave and resent it.

The first evening meal was something I looked forward to. At last, the chance to sit down and eat. Dominic and I got our kids down to the hall by moving in shifts. At the table the loud speaker once again reminded us we were on foreign turf. There was a Boy Scout Prayer and then food. I started eating. Then realized half the kids couldn't feed

themselves. With unshielded anger, I started pumping spoonfulls of peas and potatoes into open mouths. Any semblance of good will or sympathy was gone. My liberal do-goodism lasted one afternoon and I wanted out.

By evening I was exhausted and angry. I questioned the camp, the loudspeaker that kept us moving, and myself. I couldn't get close to the kids and didn't want to. A fear emerged in my mind that this illness surrounding me would somehow rub off. That if I touched a disfigured limb or body, I could be poisoning myself. In a nightmare I dreamed of children's legs and heads unscrewing. Parts of bodies coming off in my hands.

DAY 2

Morning greeted our cabin not with the warmth of the sun, but a chilling cold and smell of urine. Three kids wet their beds through. A fourth rolled over on an artificial urine bag causing it to burst. In a stupor Dominic and I began the clean up and morning runs to the bathroom. The loudspeaker hurried everyone to breakfast with a trumpet "you gotta get up, you gotta get up . . ." What a joke.

It was noisy at breakfast. For the first time, I felt the kids' presence as individuals. Each of them watching Dominic and I. Stealing a glimpse and then staring. Perhaps looking at us for the first time. Seeing if we would stay. It wasn't a challenge but a real question. I felt it. I looked back.

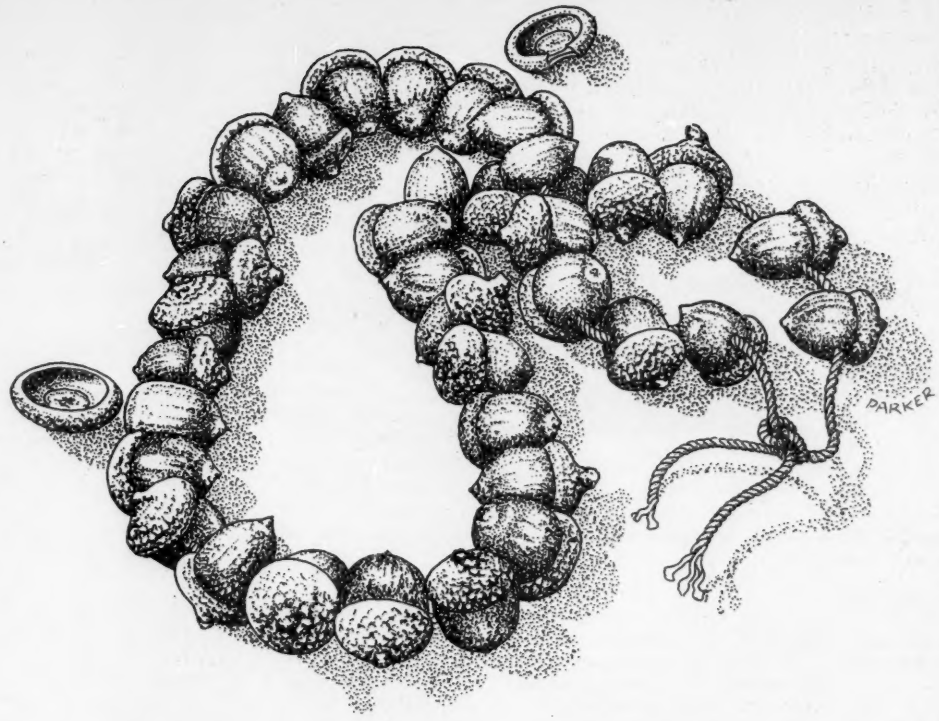
Kids at our table and cabin included Benny B. Benny was black, peanut in size. Polio had taken his legs but not his gall or heart. He was the most mobile kid at camp. One kid that Dominic and I didn't have to push or help with the toilet. He was his own man. Most kids have a "thing" they do. Something special. For Benny B it was speed. With a crash helmet pulled tightly over his head, he hunched forward in his wheelchair like a dirt track driver in a stock car. Once snuggly into position he reared back with both arms, giving the chair a rocking motion that could be thrust forward at incredible speed. He peeled rubber and was off. Hydroplaning across the dusty camp floor. Then spinning and heading back to the cabin. Finishing the dash with a "wheelie" that only he could do. The spokes on Benny's chair were decorated with stickers and reflectors. At night he was a light streaker through camp. On the back webbing of his chair was the name of this speed freak. Benny B.

Spider was another kid in our cabin. It was a funny name because Spider didn't have any legs or arms. He had stumps that stuck out of his short frame like broken branches out of a tree. Like Benny, Spider was alert and perceptive. You could tell by the eyes. Children handicapped by illness that floods the brain with fluid, or strikes off oxygen at birth seem to stare without seeing. Attention seems a constantly moving magnet. Eyes seem cloudy – unable to sparkle or hold on to anything. Spider's eyes held everything. And what his eyes couldn't hold, his mouth tried to trap. Spider loved to talk and talk and talk. It was like being in the presence of a juke box machine. The only difference was that this recording device was self-operative. Spider had to be fed but even that didn't stop him. He just talked, swallowed and talked some more.

Far less active and alert than Benny B or Spider was Thomas Stewart. He had muscular sclerosis. The cruelest ailment of all. Thomas must have been fifteen or maybe sixteen. It was hard to tell. Benny B and Spider looked and acted like the eight and ten year olds they were. But Thomas, it was hard to know anything about him. All the children were light in weight but Thomas was the lightest. He weighed about 35 pounds. Picking him up was like holding a collapsible tent. It just gave way. There was no center of gravity. His bones seemed unconnected. Indeed that's what the disease had done. Over eleven years it had slowly and certainly robbed Thomas of the fibre and muscle that hold the body together. I think the act of watching and feeling this gave Thomas a knowledge of depression not held by children afflicted from birth. Thomas had eyes that seemed like wells. They locked up secrets. His mouth was always dry – almost crusted over. Pinched tight, as if to hold out the invading air or hold in some final scream. He watched the world about him but gave nothing in reply. He was sullen, hunched over in his chair, always covered by a dark blanket. Unwilling to move unless moved. Pensive, patient, and dying.

Martin was the most able-bodied child in our group. Like other blind children in camp he had a constant smile and seemed in perpetual motion. Sitting still he would rock forward and back. Even standing, he swayed rhythmically. I wondered at what sound or unseen tide pulled at him. Martin was extremely likeable and outgoing. He was about fourteen. Tall and slender with bright red hair that stuck out in every direction. In strident steps he would march across the camp ground. I was amazed at how straight he always walked. In many ways he seemed to navigate like a ship. He could sense tree limbs and moving objects at head level. His only sensory block seemed at ground level. A slight indentation on tree root would cause a faltering followed by a stream of cussing. It was self-cursing – not directed at the obstacle, but at himself for not "seeing" it. Martin seemed a good kid. A little older and wiser than Benny B. or Spider and more demanding of himself than Thomas Stewart or Arid.

Arid was the fifth and final kid under our charge. He got his nickname due to his smell. It was awful. Arid or Aaron Gerwalski didn't have a bladder or the normal means to pull waste from the body. His skin was always clammy. A large water bottle-looking bag was attached into his intestinals. The bag, strapped to his leg, collected a urine waste that had to be



emptied every hour. He hated his own smell as much as those around him hated it. Arid wasn't a humorous name. This condition was terrible for anyone to carry, but for a young teenager it must have been overwhelming. The smell repelled any gesture of friendship. It stalled and interrupted any conversation before it could begin.

There you have it. The kids were gutty and maybe even the basis for lots of self awareness, but I wasn't enamored by the prospect. I mean this wasn't the way the job description read. Maybe I could deal with one child but the thought of responding to such a thunder of pain, well, I couldn't do it. I wanted to go home. To get to the beach. To run as fast as I could. Lay in the warm sun. Breath in deep gulps of ocean air. Anything but care for this carnage. I couldn't do it. And didn't want to try and fake it.

In our first day of activity we were assigned to the craft area in the morning and swimming in the afternoon. I contemplated getting sick or being called away to a family emergency. I also realized that I was afraid of any action. I was afraid to leave and afraid to stay, for the same reason. There was no bravery or conviction in my action. I simply decided to stay. Like Thomas Stewart I would close off all thoughts. I would endure.

At the craft table I rounded up Benny B., got Martin to work with Spider and gave the quiet Thomas Stewart and Arid a private work space. Dominic went to scout out the pool area and determine what kind of water activities we might get into. The craft table was full of left-over Boy Scout materials and sample projects. There were whistles, hatchet holsters, Indian head dresses, and book ends made out of pine cones. I busied myself with a nut necklace. It was an act of frustration. At least it symbolized how I felt. Crazy to be here. Absolutely crazy.

Benny B. asked what I was making and I told him, "a necklace." He could see it wasn't a designated project. Spider asked what the necklace was for. And asked. And asked. Finally I blurted, "I feel a little weird being here, so I've made myself a necklace of nuts." Spider didn't stop or recoil, just laughed, "So do we counselor, we're all a little nutty here!" Benny added, "You might call us the nut people, yea that's a good name for us." I turned to Spider to tell him, "My name isn't counselor, it's Ron." He was already off with another question, "Mr. Counselor, Ron, can we make a necklace like yours?" "Sure."

When Dominic returned we had a surprise for him. His very own acorn necklace. Benny B. had raced about collecting every nut in sight. Spider told him where most of them could be found. Martin strung most of them together. Arid was delighted by the smell. Thomas Stewart by the gift. Within this brief encounter we all had this crazy nut necklace in common.

In moving to the pool other kids noted the necklaces. Spider was quick to explain the sight. "We're the Acorn People. Can't you see?" So we were dubbed and christened by our own act. Like it or not, we

Tom Parker

became The Acorn People. My fellow travelers and I were now drawn together like blood brothers. We would share a common history and fate. We would endure together.

I'm glad I stayed. The swimming pool was a new world for everyone. The water gave buoyancy and freedom to the bodies and pent up children in all of us. Each child was given an orange safety belt and carefully lifted into the pool. That's where the careful and restricted movement ended and the teasing, splashing, racing began. Children and counselors held in bondage to chairs and harnesses were free. It was as if the water gave us permission to push each other and not just be pushed. We were comic aliens on a strange liquid planet. Popping up and down in the water, we held each other and bobbed in unison to create huge waves. Chased about like orange speed boats. Squirted and spit at each other. Or just relaxed and let the current of play move us about. Imagined sharks and sea monsters, and pincher bugs. Yelled and screamed.

Each kid approached the water in a delightful way. Arid had to paddle about in an inner tube holding his bag above the water. It was his secret weapon. He threatened to squirt anyone that splashed him. It was a good threat. Benny B. grabbed a tube and you guessed it – he became the pool's fastest inner tube. Arms flailing away like a windmill, he looked like a pool cleaning machine gone berserk. If Benny was the speed king of the pool, Thomas Stewart was the luxury cruise ship. In elegant grace Thomas ended up sitting on three inner tubes quietly riding the waves made by the rest of us. As for Martin, he was the classic submarine. The pressure of the water and the resilient noise of the pool seemed to give Martin a keen sense of what was happening. I watched him dodge and chase Benny B. with radar intensity. His greatest pleasure however was a real fright. For some reason he simply loved to unlock his belt and sink to the bottom of the pool. He would sit there cross-legged and motionless until his lungs called for breath or I would reach down and grab him by his red hair. Thank God for that red hair. It was like a buoy that signaled for lifting.

Of all the children in camp, Spider was the most amazing phenomena in water. Just as I was about to commit myself to holding him in the pool he said he wanted to show me something. Spider could swim. I propped him up at the edge of the pool as he instructed and then waited in the water to catch him. With a head-first plunge he was in the water and pulling himself through it like a dolphin. His body seemed to lengthen out and undulate. First the head would surface, take a breath, then shoot downward only to arc back to the surface and dive again. With this repeated whip-like motion Spider could swim. In watching Spider move with the water and use its turbulence I thought of the fear he must have faced the first time in water and the endurance that allowed him to come to terms with this fear.

As our session in the pool ended Spider put on a demonstration of his ability by swimming the length of the pool. Several groups of children from other cabins gathered about. All watching intently this single figure submerge and surface its way across the pool. I don't think Spider had ever swum this distance. His movement in the water slowed and had almost stopped when he finally nudged the end of the pool. When I lifted him from the water his entire face broke into a grin. There were whoops and smiles from everyone. It was not a smile I was familiar with. Not the smile of a raucous ego or aggressive threat, but the smile of knowing. The blind children show this emotion best of all. It's as if their whole face lights up. Everyone was smiling with Spider. Me too.

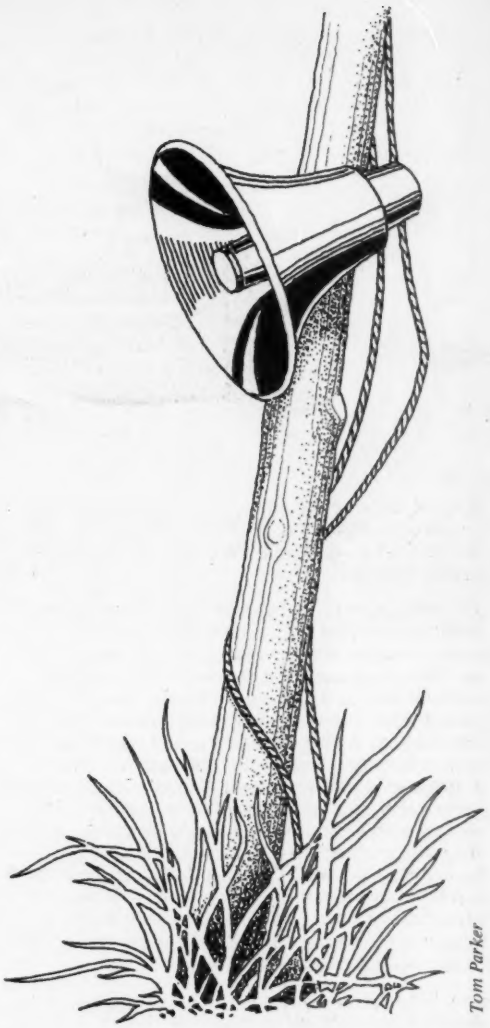
In our second evening of camp the Acorn Society had its first meeting. The camp loudspeaker had blared its goodnight. A lantern was our only light. It was a warm light that matched my feelings. Everyone was accounted for. Heads cranked out of sleeping bags to meet the flickering shadows. To stay in touch. A long day had passed. But we made it. I sensed that

the trial I felt was shared. It was hard on everyone. I retreated in thought remembering how Benny had cried in the bathroom when I tried to change him. I was mad at the time; he must have been hurt and humiliated at the rough treatment I gave. The day was full of a minutiae of events. Small victories. Just getting by was super. I felt good. I could make it. There were events like the acorn necklace and Spider's swim to keep us going. Dominic broke into this silent thinking. We were all just looking at each other. Dominic called the meeting to order and then proceeded to tell Mafia stories. His breath danced into the cold air. I fell asleep with Mafia gangsters and gun molls running around in my mind chasing a group of kids wearing acorns around their necks.

The boys relied on stunts of bravery to claim equal attention. Even Thomas Stewart the most distant of all putted about the pool in his barge of tubes and yellow jackets. I caught him smiling for the first time when he oh so slightly nudged a girl in an equally high pile of tubes. They were playing bumper cars in a soft but deliberate way. It was almost erotic. Bumping and touching each other through the elasticity and movement of the tubes.

All my questions about sex and the handicapped were answered in front of my gaze. If ever there was a dance of affection, with taunts and prowess and just plain sexual play it was taking place in the splashes and noise before me. Our red haired submarine found three girls of similar inclination and down they went. Arid was being pushed by Benny B. and a group of younger girls. They eventually made a chain of bobbing bodies that moved around and around the pool, interrupted by occasional water fights and screams of enjoyment. By the end of the hour, kids were helping and teaching each other their unique water tricks. There was a great amount of speculation as to who had a crush on whom. Spider had it all figured out. He had a mate for everyone at camp. As for himself, well, it was a toss up between two of the women counselors. He liked older women.

Dressing took place at record speed. There was a new excitement in the air. Leaving the pool area with a cluster of children I noticed that a blond girl named Mary was wearing an acorn necklace. She was a tall angular girl with a kind face and warm smile. She seemed to be aware of our presence as we started up the hill toward our cabin. I turned to Martin. He still had on his necklace. So did Thomas. The question of how she got the necklace slid from my mind and then back again with a rush as Arid complained, "I've lost my necklace . . . hey can we stop so I can make another?" There was a chuckle at this revelation. Benny asked, "Where did you lose it?" Spider and Benny B. chided together, "Couldn't have been in the pool could it? Couldn't be you gave it to Mary . . . Could it?" Arid looked slightly sick and then relieved as Martin saved the day with an idea. "Let's make a bunch of necklaces, OK?" Benny, not letting go, "Yea, we can give them to our girl friends." Thomas Stewart surprised us all by talking. He just didn't say much. His words were brief. "Not a bad idea."



Tom Parker

DAY 3

That Goddamned camp loudspeaker should be shot. It's warm and cozy and I don't want to get up. The floor is cold and the wheelchairs and leg braces chill the touch. Like a calvary unit Cabin Four is getting harnessed for the day. I disconnect Aaron's bladder bag and run down to the bathroom to dump it. It's at least warm. No one has a wet bed. Yippee. Yippee. I'm amazed at how quickly Dominic and I have adapted to the task of getting everyone dressed and moving. The cabin is very confining. Definitely not built for wheel chairs. For the first time I sense

it and it's spoken about – we are all beginning to look forward to the day ahead. In our morning trudge to breakfast I notice I still have on my acorn necklace. Dominic observed my discovery and pointed out that he did also. So did Benny and Thomas. We all did. The Acorn People were on the move.

Camp Wiggin was administered by a retired army colonel, Mr. Bradshaw. He had a ruddy complexion and a manner that matched. He administered camp like a mandarin war lord. One day he would be at breakfast reading orders and "thoughts for the camper" and the next day he would be gone. The following day he would swoop into camp with visiting dignitaries, give another set of directives, and be off again. What he left in his wake was a set of regulations and schedules that were hand-me-downs from the scouts. They might have made sense to a group of troopers that could move between the craft center and the pool in five minutes. For us, each move was a campaign. Just getting to the pool took half an hour with another half-hour to get out of clothing and ready for the water. The recreational schedule of the camp was laid out in hourly blocks. It went something like this. Breakfast 8:00, Crafts 9:00, Hiking 10:00, Study in the meadow 11:00, Lunch 12:00, Open recreation 1:00, Swimming 2:00, Dinner 4:00, Camp Fire 6:00, Taps 7:30. It was a masterful plan. Each group of three cabins would rotate about the camp on its own schedule. It was like a merry-go-round. We were always moving, getting ready to move, or finishing a move. Out of the corner of our eye we could see everyone else engaged in a similar pursuit. Besides the obvious problem of never having enough time to really do anything, this carousel schedule kept the kids from meeting other kids. You were always with the same group. This meant boys and girls were never together. Oh, perhaps that was the reason behind all this. Dominic and I decided at breakfast to talk with the kids about the day ahead as if we could plan it ourselves. Following breakfast we went directly to the pool. The decision was unanimous.

As we approached the pool it was being used by a group of girls. I could see the headlines. "Group of boys wearing nothing but acorn necklaces attack girls in the camp pool!" That's not quite the way it happened. Participants in this first-ever "integrated swim" were self conscious and then flirtatious in a typical pubescent way. The boys worried about their trunks being tightly tied. And their hair. My God, I had to comb their hair before they would venture out to the pool side. The boys kept to one side of the pool. The girls attached to the other like a string of pearls. Soon like a melting ice cream, the sun and water worked its magic. Children, no, young adults, no, children, were playing the games of dunk and run or just plain show off. In coy glances and gossippy chatter the girls attracted the attention of the boys.

We set about making acorn necklaces by the gross. By the end of the afternoon we had successfully cornered the acorn necklace market. There wasn't an acorn anywhere in sight. Not one. Benny wore his necklaces and what he couldn't wear he stuffed in suit cases. The others simply hung the treasure from their chairs. Throughout the days that followed they gave them to everyone. The entire camp – kids, counselors, cook and even Mrs. Nelson the old nurse became Acorn Society members.

DAY 6

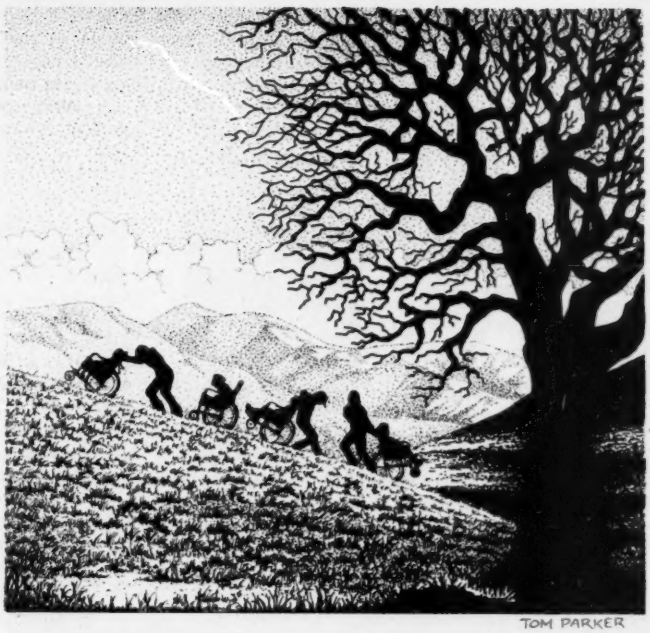
The breakup of the schedule and giving of the necklaces drew the camp together and gave us all a feeling of confidence and penchant for adventure. One particular adventure, I shall never forget. It was the mountain. Our interest and knowledge of the hill came from the ever-present loudspeaker. One evening the normal recorded taps and Boy Scout pledge was followed by an announcement that special merit badges would be awarded to all those completing the climb to Look Out Mountain.

Benny B. picked up this errant message, "If the Boy Scouts can climb that mountain, can we?" Dominic and I exchanged glances of doubt and surprise. Our thoughts were picked up. Spider sided with Benny. Thomas was quiet. Arid didn't think it was too neat of an idea. Martin just stood there and then with all our attention fixed on him he started stamping his feet in an exaggerated march step. Hefting his knee high and then softly pulling his foot to the floor. Then with his whole body in movement he pumped his arms and in mime-like fashion demonstrated that he was going to climb that mountain. He was marching off to Pretoria? There was nothing left to do, but follow.

In the morning we made plans to find and climb Look Out Mountain. Maps in the camp office gave the trail markings and location of the Mountain. It was a six mile hike round trip. We had no idea of the terrain. For supplies we took a bag of apples, some carrots, raisins, canteens of water and three kitchen knives. The knives were for protection. Like a military convoy we broke from camp at the first sign of morning. Passing down the rows of cabins a few sleepy campers heard our clanking progress and asked where we were going. Benny was our voice, "To Look Out Mountain."

Dominic led the way pushing Spider. Next came Benny B. wheeling himself followed by Martin pushing Arid. I took up the rear of the column pushing Thomas Stewart. We looked and sounded like an old fashioned wagon train. Like the pioneers before us, our faces were pushed into silence by the unknown that lay ahead. There was little talk and a strange absence of humor. A sense of fear overwhelmed any thought of adventure. Each curve in the trail presented an obstacle. Our greatest hardship was trailside bushes and branches. They slashed against the

wheels and if we were not careful, entwined themselves like tentacles around the wheel spokes and foot rests. Forging through this undergrowth reminded me of Humphrey Bogart's voyage of the African Queen. The trail shrank, our effort to push the chairs increased tremendously. In methodic lunges we crossed fields and cut into a dark wood. For the first time in my experience of pushing a wheel chair I felt Thomas shift and lift his weight in an effort to ease the strain of movement. It was a slight adjustment but it meant he was pulling his body as hard as I was pushing. I strained ahead to see that Arid and Spider were equally at work, lifting their weight and pushing branches aside using whatever energy they had to help our progress. The trail started upward. We had to turn around and pull the chairs from behind. Benny was forced to pull his wheels and then break with each stroke. Our movement was reduced to a pull, stop. Pull, stop. Pull.



TOM PARKER

Perspiring and heaving for breath, the thought of going back haunted me. I just didn't want to turn around. It would be better to inch our way forever than stop. Pull. Stop. Within this exertion my thoughts wandered. I felt escaping sensations experienced in long distance running. It's like the mind detaches from the body. In flights it finds refreshment in abstract wonder. I pondered the condition where people work at intricate practices and behavior without benefit of knowing where they are headed. Surely that if the situation I am in. Where am I going? And why am I at the base of this mountain fighting to see the top. Is it the climb that's important? Or the summit? Can it be both? Or something else? Perhaps it's how we go down from the hill that counts. Or is it in simply enduring that we find the strength and purpose we seek?

Reaching exhaustion, Benny had to stop. He didn't say a word. Just stopped pushing. His chair slowly slid to a halt against Martin. Like a train being derailed we twisted to a halt. Chairs and bodies stacked upon each other. Without giving anyone the chance to think about our predicament Spider started talking. In a shrill and quick voice he began playing the role of expedition padre. Dramatically taking his canteen he sprinkled water on the hillside and proclaimed, "I hereby name this place Benny's Landing." Everyone looked up. Spider was still talking, "And claim this place and all its riches for the Acorn Society." He crossed himself and blessed the soil. Finding a willing audience Spider continued, "Mr. Thomas, I appoint you expedition recorder, Martin you're expeditionary leader, you counselors, you're, let's see, you're soldiers. Benny, you're our scout." The drama gave us a chance to relax and realize our accomplishment. To look around for the first time in our journey. Feel the warmth of the day and the aroma of damp grass. We were in the rib of a small hill. The sun angled through the trees as if in search of someone. It splintered against the mass of rising moisture and cascaded to the ground. The air was heavy, full of light and flying things. We seemed surrounded by a soft but definable noise. A humming of insects on the move. Leaves turning to the sun. Seeds in flight. Morning dew evaporating and billowing upward. The ground drying and pulling tight.

Everyone seemed entranced by our discovery. Here we were sitting in the middle of a forest with wheel chairs and experience that had only known city streets and "convenience ramps." Spider again broke the concentration. "Well," he said, "what are you waiting for, Aaron? You're the exploration cook, break out the food." Spider was still talking as we took up the food, passed it around and started eating. "We have more places to explore than this place, you know." With this moment of rest and Spider's encouragement our journey became enjoyable. We knew there were more places to meet, and with some patience we would find them. And so we started off again. Benny, pleased to have a place named after him, was thrilled that each time we halted there would be a similar honor. Sure enough, we "discovered" and marked our progress with Benny's Rock, Benny's Fall, Benny's Number 2 (in reference to a toilet break), and Benny's Vista. . . .

By the end of the morning we had steadily climbed into the foothills toward Look Out Mountain. Spider was talking all the way. Naming birds, plants, and historic sights of interest. Thomas was keeping a mental diary, repeating points of importance to Benny and the rest of us. Arid was directing our culinary use of supplies and dreaming up delicious ice cream sodas and banana splits. Martin seemed to spread out. He swung erratically from side to side in his effort to pull Aaron. His head moved constantly as if it were an antenna tracking some wondrous delight. Spider finally ran out of things to name or count. Without hesitation he created and performed what he called the Acorn Marching Song. If you've ever heard the slave song "Mary Mac" you will have some notion of the noise we made crossing the wilderness.

After our succession of ceremonious starts and stops we reached the final grade to the summit. We had covered over two and a half miles. The final half mile looked straight up. More forbidding than the incline however was the deterioration of the trail. It simply stopped. The final grade was a hillside of slate rock and loose gravel. There would be no way to pull or push the chairs up this. The wheels simply spun around for lack of traction. Spider called this place "Desperation" but no one laughed. Dominic suggested, "How about us trying to carry everyone?"

Thomas nixed the idea, "Not me, I'm not going up there on someone's back." Aaron had a similar plan, "I'll watch." Spider and Benny were talking wildly about a movie they saw in which climbers used ropes and things. During our deliberation Martin had moved several feet up the hill without our notice. He called down to us, "Hey you guys, it's easy." Martin was sitting down facing downhill. By moving his legs under him in a squat position and then pushing back, he edged up the hill in this sitting posture. He looked like he was rowing a boat. Only instead of rowing across water he was literally rowing up the hill on his bottom. Using legs and arms in an accordion fashion he made steady progress. Benny was delighted, "Martin you're amazing." Spider added to the compliment, "Make sure that man gets the Mountain Cross." Thomas and Aaron were still doubtful. Leaving their wheel chairs was not an easy thing to do.

After a long debate and several demonstrations by Martin, we decided to make the ascent. Dominic sat against the hill and I placed Spider in his lap. Using belt buckles and safety straps from the wheel chairs I tied the two together. Dominic tried a few rows up the hill. It worked. Spider strapped to Dominic's stomach gave both of them the opportunity to look down the hill as they inched up. It also freed Dominic's legs and arms for the hinge like movement and balance necessary to squeeze up the hill and not slip back. Benny was next in line. He wanted to try it by himself. In a trial effort he worked his way up the hill and right out of his pants. With his insistance we tied a pillow from one of the chairs to his butt. He was ready. With his strength he just might be able to drag his body the distance. Martin and Aaron were next. Martin's confidence helped Aaron. In a sitting position Martin shaped his body and legs into a lap. I gently placed Aaron against Martin and bound them together. Thomas and I were at the end of the ladder. I sat on the ground in front of Thomas and pulled him head first out of the chair and onto me. We twisted and rotated until both of us were comfortable. Then tied ourselves together.

Like a caterpillar we edged our way up the slate. The loose rock gave and slipped into pockets that could be used as footholds. Our trail looked like a smooth slide bordered by tractor-like gorges. I thought to myself how a hiker someday would discover our tracks and the Santa Cruz Mountains would have evidence of its very own Big Foot. Martin's invention was marvelous. Who would have thought of going up hill backwards, sitting on your bottoms? We moved in a syncopated unison. First the legs pushing against the hill followed quickly by pushing with both hands. We would stop to rest and then continue. We observed the valley floor below us, the tree line slipping beneath our vision. We could now see valleys moving away from our vantage point like huge green waves. At two o'clock, according to Spider, we reached the top of Look Out Mountain. He gently gave the Mountain one of his necklaces. Not the act of a conquerer, but of a friend. We had done it.

Like all accomplishments our attention shifted from the joy of laying across the peak of this mountain to another vision. The sky above us. Even Martin seemed to study the traces of clouds and the blueness of the space above us. It was strange, there was no jubilation. What had been the ultimate victory was now matter of fact. The sky beckoned our attention, it gave us peace. There were seven of us laying faces to the sky, just watching. A lonely piston engine plane droned by. I love that distant waning sound. We grabbed for a mountain and found the sky. I don't think any of us had ever seen the sky in quite this way. The wheel chair and city life we all knew just didn't give us the chance to face the sky. It was wonderful. This must be the exhilaration that drives explorers. The surprise of always finding another vista, a new thought, an unexpected strength. Doing something no one else would dare. And in the end finding something as simple and everpresent as the sky.

The return trip to camp seemed half the time. We passed things we knew and places that were familiar. We knew where we were going. It was a quiet return. Our pace increased as we approached camp. Perhaps it was the idea of a waiting dinner or the chance to tell everyone about our climb. We wouldn't tell about the sky. It was our secret.

We arrived late to the dining hall. In dusty halos we tramped and rolled in. I guess all explorers expect a ticker tape parade of some kind. Surely the world knew of our exploits. But the dining room was unexplainably quiet.... ■

[To be continued in the next issue.]

Take Care of Yourself

One of the most useful tools to come out of the new paramedic training programs is the clinical algorithm – big, detailed flow charts, one for each of the common medical complaints (such as sore throat, dizziness, low back pain) that might bring a person in to a medical clinic. They tell you the key questions to ask to decide whether the person needs to see the doctor NOW, needs to see the doctor sometime soon, or if home remedies are indicated.

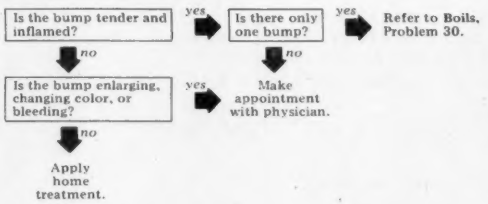
The heart of this book is the 68 most commonly used clinical algorithms, presented in full-page size with nice graphics. There are some additional chapters on "Skills for the Medical Consumer" – Choosing a Doctor, The Home Pharmacy, etc., and a little gem of an essay on Giving a Good Medical History.

–Tom Ferguson

Take Care of Yourself
(A Consumer's Guide to Medical Care)
Donald M. Vickery, M.D., & James F. Fries, M.D.
1976; 269 pp.

$5.95 postpaid
from:
Addison-Wesley Publishing Co.
Reading, MA 01867
or Whole Earth

Skin, Bumps & Lumps – 33



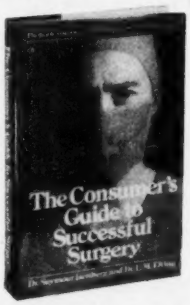
Home Treatment

The rational approach to a skin lump is to observe it to see if it changes size or color, bleeds, or gets inflamed. Otherwise, don't worry so much. In the absence of these characteristics, the only reason to have lesions removed is for cosmetic purposes. Warts can be removed with commercially available over-the-counter preparations if used consistently and carefully (Compound W, Vergo). On your next routine visit to a doctor, ask about any skin lumps which bother you.

A Consumer's Guide to Successful Surgery

An insider's look at what happens on the surgical ward. What to expect in the way of procedures and routines. Encourages you to review your own chart, seek other opinions, and to thoroughly understand what's happening before agreeing to any surgical procedure. Makes going through surgery sound as scary as it really is. Fascinating reading, even if you're not considering surgery. Should be a help and a comfort if you are.

–Tom Ferguson



The Consumer's Guide to Successful Surgery
Dr. Seymour Isenberg & Dr. L.M. Elting
1976; 341 pp.

$10.00 postpaid
from:
St. Martin's Press, Inc.
175 Fifth Avenue
New York, NY 10010
or Whole Earth

Don't let them slap you in anywhere. Get back there and look at the room. Not all hospitals will be happy to let you do this but you've every right to. If it is situated across from the nurses' station – that large round desk in the corridor that is headquarters for the floor – try to get it changed. You may have the erroneous idea that the closer you are to the nurses' desk, the better care you'll get. For some reason many doctors also think this is true. What you'll get is insomnia. Nurses are noisy. They rattle metal chart covers, drop things, use the phone, laugh, talk, and generally scamper around. If you want any peace, the room farthest from the nurses' station is for you. It takes as long for nurses to answer a bell across the hall as down it.

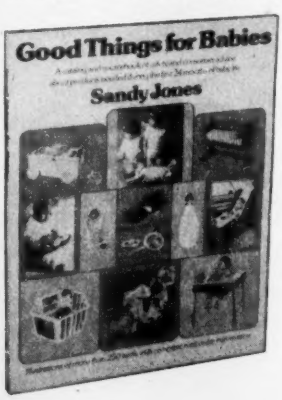
•

In 1973 the American Hospital Association, tacitly admitting that a serious problem exists, issued a statement that patients do have certain hospital rights. Among these are the right to considerate care (including privacy), the right to being informed, and the right of refusing treatment. There are many others; a letter to the AHA at 840 North Lake Shore Drive, Chicago, Ill. 60611, will get you a copy.

Good Things for Babies

Quite well done access-and-evaluation of stuff for infants. The right amount for convenient browsing by the reader, well-selected and well-reviewed. That's all you can ask.

–SB



Good Things for Babies
(A catalog and sourcebook of safety and consumer advice about products needed during the first 24 months of baby life)
1976; 115 pp.

$4.95 postpaid
from:
Houghton Mifflin Co.
2 Park Street
Boston, MA 02107
or Whole Earth

Jiffy Biffy

A suctioned adapter for your little one to use on adult toilet seat. Comes with a plastic carrying case. A good idea for travel. (Made by Tommee Tippee.)

Order from:

Westland Plastics, Inc.
800 N. Mitchell Road
Newbury Park, CA 91320
(Under $5.00).

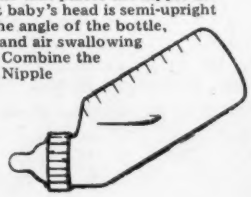
•

Correcto Feeding Bottle

An angle-necked plastic bottle that places the nipple in a horizontal position so that baby's head is semi-upright while nursing. Because of the angle of the bottle, liquids flow into the nipple and air swallowing becomes less of a problem. Combine the Correcto Bottle with a Nuk Nipple for an ideal match.

To order, write:

Royal Products, Inc.
P.O. Box 90312
East Point, GA 30344
(2 for $1.29).



I would like to write a silence

BY ANNE HERBERT

I would like to write a silence for all the men I knew and didn't know and heard about and didn't hear about who came back from Vietnam and died in single car accidents on straight roads. A silence because I still don't know what to say.

□ □ □

One way to get out of going to Vietnam was to have your father killed at Anzio and not be born.

□ □ □

The National Soul Searching About Vietnam scheduled for this time period will not be seen in order that we may bring you Watergate: Fascinating, Bloodless, and Not Your Fault.

□ □ □

We are going down the valley.

We are going down the give me a V etc.

We are going down the valley of the S-H-A-D-O-W.

We are going down the valley knowing we are better than the cheerleaders who can only yell and spell while we play instruments and have new uniforms this year.

We are going down the valley in our brand new uniforms bought by waxy wickless candy candles sold house to house at gunpoint with a smile.

We are going down the valley in our brand new red white and blue uniforms playing When the Saints, we are not remembering the words.

We are going down the valley in our brand new uniforms with fuzzy red white and blue bullseyes doublestitched by mothers on the back.

We are going down the valley trying to remember the one two three four five six seven eight routine we have to do at the end of the parade, if the field's wet our new boots will be a mess not to mention our brand new uniforms and the permanent red white and blue tassle waving from my ass.

We are going down the valley doubletime, I'm losing step.

God, I hate surprises. We are going down the valley one by one.

□ □ □

I prayed not that the fire stop but that it finally consumes me. No answer. It wasn't my story.

□ □ □

I walk around and around the tree and everyone stares and can't tell why until an expert passing by on the other side says Ah yes. A Tree Circler. and they build a fence around us with plastic engraved plaques for [Tree Circler]. [Tree]. and leave us alone and I'm safe as long as I walk around and around the tree.

□ □ □

Dogs and people make me nervous because I can't tell if they're fighting or starting to make love or which would bother me more.

□ □ □

There was this certain sound that was planning to play bass at the Armageddon good guys victory beer bash and it began with Eve's shout at the start of Cain and passed through conch shells and earthquakes and souped up V-8 engines to a tree falling in the north woods late last year and I was supposed to hear it and say hey but was in class at the time it didn't happen stopped.

□ □ □

In Hollywood it's pills. In my town it's parked cars. We're straightforward out here. You or your survived by can pretend you got confused about the number but how many reasons are there to run a hose from the exhaust pipe to your mouth?

□ □ □

God who turned on the lights, yes the same God who shaped up the void, the one who made it grow tall trees and short sweet violets and sprinkled it with fuzzy animals and you and me invites us to join his continuing effort to make the surface of the earth habitable. Can you spare a quarter for someone who doesn't deserve it as much as you don't?

□ □ □

[more→]

I know it's a great honor she said but I've always wanted to screw. No cathedrals in her honor but she scrawled her name on some good nights.

□ □ □

naked turtle not hard not fast soon smashed quick dead knows what earth looks like knows how it feels

□ □ □

What do you really want and how hard have you tried how long how often to let it get you.

□ □ □

If you don't believe the Red Sea opened for the Israelites,
you haven't been paying attention to the way life is.

If you don't believe the Red Sea closed on Pharoah's soldiers,
you haven't been paying attention to the way life is.

If you believe you know whether you're an Israelite or a soldier,
you haven't been noticing your life at all.

□ □ □

Pilate had to decide whether or not to kill this Jesus person. Some said he was dangerous. Some didn't. Pilate wasn't sure and said, "What is truth?" Jesus died anyway.

Moral: Philosophically sensitive people do not necessarily help you make it through the night.

□ □ □

And a certain man blind from his mothers womb was laid daily at the gate of the temple called Beautiful to ask alms. As Peter and John entered the temple he asked them an alms. Peter said, Silver and gold have I none but such as I have I give to thee: in the name of Jesus of Nazareth, open up your eyes. And immediately the man saw. He said to Peter and John, You have taken away my livelihood and driven me mad. And he put his fingers into his eyes.

Peter said, Come to think of it, Jesus always waits for them to ask, doesn't he?

□ □ □

Consider the lilies of the field which sow not neither do they reap and last about a week one good week.

□ □ □

When we get there we'll be able to look at the sun all day and never squint. The sun will be no dimmer but we'll be shining back.

□ □ □ □ □ □ □

An Anne Herbert self-portrait follows. There'll be some more of her in the next **CQ**, *quick, before she gets glommed by Uptown. (Note: Anne's first three bits I have brutally excerpted from a long piece called "Speeches, a Silence and a Song for Memorial Day 1977," which ought to be published in full.)*

–SB

□ □ □

I'm twenty-six, I've lived in Ohio all my life, including 7 years in Cincinnati and 9 years in Germantown, a genuine quaint, folksy, friendly small town. I'm very good at going to school and have spent a disproportionate amount of my life doing so. Four years and a degree in English Ed. from Wright State (commuter college in Dayton Ohio) and two years and no degree from Ohio State (a football rooting section in Columbus Ohio). The Ohio State time was in grad school and although there are always dozens of good reasons to quit grad school, the one that did it for me was the feeling that if I wrote one more A paper I'd never be able to write anything real. So I quit with the idea of becoming not the great american writer but a great american writer (always humble). . . . My free hours I spend searching for Truth (what else) and my favorite places to look have been orthodox Christianity, extreme cynicism, and heavy heavy negative self-analysis – and it looks like these places are where the writing comes from. . . .

–Anne Herbert

Natural Birth Control

Much as I hate to admit it, prejudiced as I am against a morality which demands a rhythm method, this looks like an accurate, conservative, responsible and useful book for people who have no compunction about bearing accidental children, abstaining from intercourse, or resorting to abortion.

Natural Birth Control *is a cogent, colloquial instruction for using three different rhythm systems in concert. The systems are: The Knaus-Ogino (calendar) method, which strives, however unreliably, to predict ovulation based on a menstrual history; the basal body temperature method, which attempts to identify the day of ovulation by the observation of slight temperature changes during the menstrual cycle; and the mucus method, which also tries to identify the fertile period, by an observation of changes in the cervical mucus.*

The book doesn't make any claims for the effectiveness of the method, and that's just as well. Stats on this combination method don't exist yet. For a highly motivated couple where the woman has regular cycles, it could be quite effective. The BBT method alone ranges from 78 - 99% effectiveness, which is right up there with the bad ol' Pill.

However, I'd like to dispute the term natural *as applied to this method. How natural would you feel about taking your temperature rectally almost every morning of your life before arising, or even speaking? — About keeping a chart, about abstaining from intercourse half the time? It sounds really contrived to me, and may constitute a somewhat Luddite reaction to medical contraception.*

However, the more birth control methods, the merrier. There are undoubtedly some for whom this method is ideal, a godsend, as it were. The choice of any method of birth control demands some thinking through. For instance, you'd better enjoy giving and getting head, buggery, boko-maru, or sleeping apart a lot if you're going to choose a method demanding abstinence.

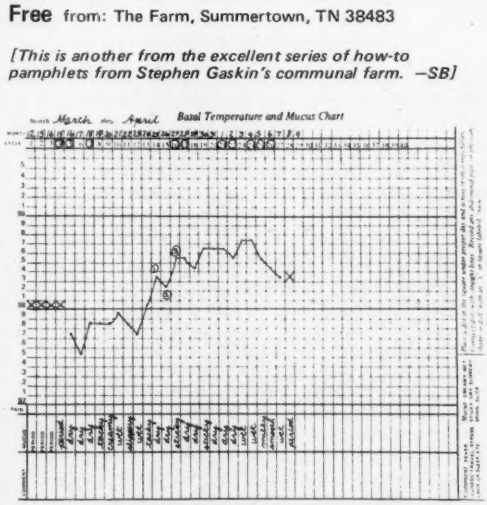
If that's the case, and you're not inclined to worry your way from period to period, get this book — it cogently, cordially explains how to do it.

—Stephanie Mills

Natural Birth Control
1976; 31 pp.

Free from: The Farm, Summertown, TN 38483

[This is another from the excellent series of how-to pamphlets from Stephen Gaskin's communal farm. —SB]



On the 9th day her mucus was creamy. She ovulated on the 12th day, and had a steep climb well over .3°. It stayed over .3° higher than the previous 6 temperatures for the days marked 2 and 3. On the 3rd morning of higher readings, after taking her temperature, she could consider herself infertile till her next period.

The cure for jet-lag

According to my sources NASA did a major study a few years ago on the causes, disturbing effects, and possible cures of jet-lag — the psycho-physical dislocation that goes with travelling rapidly across time-zones. Apparently the study turned up an at least partial cure for jet-lag, but NASA refused to publish it.

The cure for jet-lag is orgasm.

CQ *readers who travel are invited to do individual research on this subject — how soon after arrival, how often, during arrival, instead of travelling, alone versus with somebody (preferably a local?), what else works, etc. Also does anyone know more about the NASA research, or is that apocryphal?*

Send your reports and analysis to **The CQ**, *Box 428, Sausalito CA 94965. As usual, we pay $10 for anything we print.*

—SB

The best sexual lubricant

Coconut oil.

Saliva dries up. K-Y jelly is a mineral oil. Kama Sutra oil and its imitators are expensive, cloying, and untasty.

Sex without lubrication easily tends toward discomfort, brevity, and unimaginativeness.

Coconut oil is cheap, organic, odorless, flavorless, and easily available (at any organic food store, where it's sold as cooking oil). Coconut oil in the jar is semi-solid, like butter, but it melts to a clear oil at the touch of human skin, warm and slippery. Afterwards it absorbs into the skin. Some users melt the oil in the jar for personal repackaging in cold cream jars, camper's squeeze tubes, etc. There's a recipe for homemade oil on p. 100 in this **CQ**.

No one I know who's used coconut oil has ever quit.

An oil footnote. The Woman's Movement has done well in educating men in such matters as due (but not exclusive) attention to the lady's clitoris, avoidance of chafing away at a dry vagina, etc. Therefore it is surprising how few women are sensitive about the male equivalent — dry friction on the penis, ambivalently welcome at best compared to friendly oil.

—SB
[Suggested by Toni Ayers]

On references and sex

Dear Josephine Hill,

CQ has won my loyalty by offering serious access to alternative, ecologically sound lifestyle tools. CQ has been a source of sound information with heart. Besides its exciting speculative bent, most information it offers is footnoted. This I assume is more than just a casual tendency. Corroborating a statement makes the difference between a response of snide disbelief and an acceptance of a statement as true, as believable. The information-tools CQ offers have been reasonably strong tools because of this.

Your "Sex Notes" in the summer issue breaks this tool tempering tradition. The subjects you bring up are interesting and worthy of pursuit . . . but where? For example:

> "Vaginal pH controlling sex of offspring is certainly not common knowledge." Where can I look for support of this fact in the raw?
>
> "Numerous reports of how men nursed infants . . . have accumulated in . . . literature . . ." Where? I want to see!

Your column is worth at least a dozen juicy footnotes.

There are also statements which weaken the information value and credibility of your Notes. ". . . 0.3 micrograms were remaining in marketed beef." makes no sense; because, 0.3 micrograms must be related to some unit of beef such as 0.3 micrograms per kilogram of beef. Your saying 90% of women taking the morning-after pill have no need of it indicates a fundamental misunderstanding of statistics. Please have someone explain this.

Please don't read too much hostility into this letter. The criticism is meant to be friendly – we're on the same side.

Sincerely,

Roger Leverette
Physician's Assistant Student, Baylor College of Medicine
Texas Medical Center, Houston, Texas

Estrogen Drugs: Cancer by Prescription?

by Josephine Hill

Since synthetic estrogens were synthesized 40 years ago, drug companies have devised numerous uses for them and advertised them to physicians in medical journals. In this way, the use of estrogen drugs in medical practice is directed in part by the economic motives of a profit making industry. Hormone drug manufacture has steadily increased so that today estrogens are offered to virtually every U.S. woman from puberty throughout life for any of dozens of uses: the oral contraceptive, estrogen replacement at menopause, the 'morning-after pill' contraceptive; to dry up breast milk after childbirth; to treat acne, thinning hair, menstrual difficulties; and other real or perceived gynecological problems.

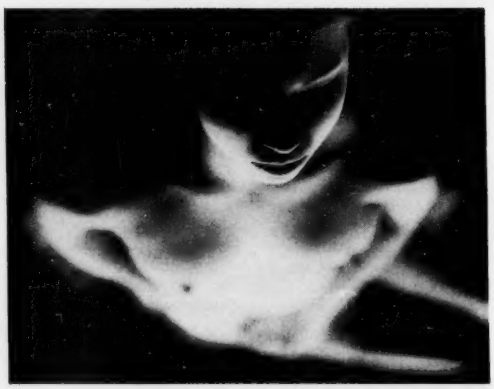
Currently 91 million estrogen prescriptions are written annually for a female adult population of 60 million.[1] In the last several years, sales of estrogen have quadrupled,[2] in spite of the fact that the incidence of cancer of estrogen-dependent organs (breast, uterus, cervix, vagina) was observed to be rising in association with estrogen use.[3, 4]

CURE FOR HYSTERIA

Historically, many of the decisions about how hormones should be used were based on value-laden judgements on the part of one class (male physicians) about the normalcy of another. Emotional and physical 'disorders' were often defined into existence and fitted to drugs that could 'cure' them.[5] The word 'estrogen' originally meant 'cure for hysteria.' Today estrogens are still used to alter female behavior, both physical and psychological.

Many estrogen drugs have never been proven to be necessary, most have never been proven to be effective,[6] and none have been proven to be safe. The latency period between the taking of these drugs and the development of cancer can be as long as 20 years,[7] yet the U.S. Food and Drug Administration approves new uses of estrogen if they have been 'proven' safe after short-term use by test groups of women.[8]

Josephine Hill is a freelance medical writer living in the Bay Area. –SB



INFORMED CONSENT

The vast majority of physicians prescribe estrogen to women without informing them of the diseases which are known or suspected to be caused by estrogen, and without mentioning the risk of cancer 10 - 20 years later. Many physicians still believe that estrogen drugs may protect against cancer and heart disease, and for a few individuals this may be true. That physicians themselves are unaware of the link between estrogen and cancer is apparent, although studies pointing to the cancer-causing effects of estrogens in laboratory animals, and in some humans, have appeared in the medical literature for two decades.[3,4,9,10,11,12,13] Prescription package labeling for the oral contraceptive (an estrogen drug) still does not contain the warning that estrogen can *promote the growth* of cancer in a woman who already has hidden breast or uterine cancer (which can exist for 6 years prior to detection),[7] and probably *cause* it in a certain proportion of users. It is estimated that 225,000 American women currently have unexpressed breast cancer,[14] so estrogen is dangerous for at least these women.

Each year about 197,000 cases of cancer of the estrogen target organs are diagnosed in American

women. Of these, 88,000 are breast cancer, 27,000 are uterine lining cancer, between 20,000 and 40,000 are cervical cancer, and the rest are ovarian or genital.[15] That estrogen plays a role in the growth of cells in these organs has been known since the discovery of the hormone. But only in the last year have studies associated an increase of uterine cancer, and possibly breast and cervical cancer, with the taking of estrogen drugs over a prolonged time, such as with oral contraceptive use and hormone replacement at menopause.[16,17,18]

The hazards of estrogen use are similar whether the estrogen drug is synthetic or natural.[7] By taking even small amounts of estrogen, such as in 'the pill', we profoundly disturb the delicate hormonal balance on which 50 metabolic systems depend.

Unlike many drugs, most estrogen prescriptions are written for healthy women for nonmedical purposes. Ten million U.S. women take the oral contraceptive[1]; eight million prescriptions are written every year to replace estrogen in menopausal women because their natural estrogen has ceased to be produced; about 40 million women have been given DES (an estrogen) to dry up their breastmilk after childbirth because they did not wish to nurse, although the drying up process will occur naturally without the aid of a drug. Millions more take DES as a 'morning-after pill', to control menstrual irregularities, or for cosmetic uses like treatment of acne and thinning hair.[19] Most uses of estrogen have never been proven with clinical studies to be effective or necessary.[6]

Cancer is not the only or even the major effect of estrogen drugs. Stroke, heart attack, high blood pressure, blood clotting, gall stones, benign liver tumors, birth defects (if taken while pregnant), and a host of other problems have been demonstrated to be associated with or caused by estrogen use. Sterility can occur in a small proportion of long-term oral contraceptive users.

It will not be known whether the 'pill' increases the frequency of cancer until women have taken it for 20 years, the time required for cancer to be expressed. However, preliminary studies have already shown *sequential* oral contraceptives and estrogen replacement at menopause to increase a woman's risk of developing cancer.[16,17,18]

The FDA grants approval for manufacture of new drugs if the producer can prove that the benefits of the drug outweigh its risks to the consumer. That the pharmaceutical industry earns over $120 million annually from the manufacturers of oral contraceptives alone may make an objective assessment of the risks of estrogen more difficult for industry scientists to reach.[20,21]

Consumers may demand estrogens as much as physicians supply them, but which comes first is a question of the chicken and the egg. That physicians misuse estrogens is a documented fact: although studies in the 1950's proved that DES was useless as an anti-miscarriage drug, physicians continued to prescribe it for 20 years, to 6 million pregnant women.[26] And now that the FDA finally banned the use of DES as an antimiscarriage drug, because it caused vaginal cancer in the daughters of some of those women, physicians continue to write about 11,000 prescriptions a year for DES for 'prenatal care' for pregnant women.[1]

It would be unwise to repeat the tragic mistakes made with DES with other estrogen drugs. That lesson calls for increased conservativism in the use of hormones, and research into safer methods of birth control.[25] ■

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ODD BODKINS..
THE RETARDED ADOLESCENT AND HOW HE GREW..
1
SIGH..
WHY SO GLUM CHUM..
2
SAME OLD THING.. I HAVE A DIFFICULT TIME SOLVING PROBLEMS..
YEAH.. WHAT KIND OF PROBLEMS?
3
WELL.. IT SEEMS THAT MOST ADULT SITUATIONS THAT ARE NORMAL FOR OTHER PEOPLE GIVE ME A TOUGH TIME..
HMMM.. SOUNDS AS IF YOU DIDN'T LEARN ENOUGH AS AN ADOLESCENT.. PERHAPS YOU AREN'T AN ADULT..
4
NOT AN ADULT..? THAT'S NOT TRUE.. I'M ALL GROWN UP..
KID.. NO ONE IS ALL GROWN UP UNTIL THEY ARE DEAD! UNTIL THEN YOU ARE STILL GROWING.. AND RIGHT NOW WE NEED A WAY TO SPEED UP YOUR GROWTH

Dan O'Neill's four pages. Those of you who are worried about how Fred and Hugh are doing on Mars (Fall '76 CQ) will have to wait to next issue to find out. It's not just the signal lag from Mars; Pantheon Books wants Dan to do 96 pages of Fred and Hugh on Mars, and Dan is regrouping. CQ, of course, has ironclad serial rights. —SB

5
IMPOSSIBLE! YOU CAN'T SPEED UP GROWTH! I JUST HAVE WAIT IT OUT!!
NOT TRUE.. I CAN'T SPEED UP GROWTH.. BUT A FRIEND OF MINE..HE CAN..
HEY PUBER! OVER HERE!
6
HUGH..THIS IS THE GOOD PUBER FAIRY.. PUBER..HUGH NEEDS SOME PERSONAL GROWTH! FAST!!
..COMING RIGHT UP!
POINK
HEY!!
7
BEAUTIFUL..
I HOPE HE LIKES RED.. I WAS ALL OUT OF BROWN..
8
I'VE BEEN PUBERED..?
THAT WAS A GOOD SHOT..
I DO MY BEST..
I'M SURE RED IS JUST FINE..

ODD BODKINS..
9
FRED!! TELL YOUR FRIEND TO TAKE HIS ITCHY HAIR BACK!!
BACK..? TAKE IT BACK?
IF I TAKE IT BACK, I WON'T MAKE MY QUOTA!!
10
I DON'T CARE ABOUT HIS STUPID QUOTA!! IT ITCHES!!
..AND IF YOU DON'T MAKE YOUR QUOTA..?
THE HOME OFFICE WILL BE FURIOUS!!
11
I MEAN IT, FRED! I CAN'T STAND IT!!
FURIOUS!? THAT BAD, EH?
IF WE PUBER FAIRIES DON'T MAKE OUR QUOTA THE HOME OFFICE CLOGS UP WITH HAIR..
12
DO SOMETHING FRED!! THIS IS YOUR FAULT!!
..MAYBE WE CAN GET HIM TO AGREE ON A TIME PLAN...
RIGHT! INSTEAD OF THE WHOLE LUMP NOW, I COULD SLIP IN EVERY NIGHT AND LEAVE SOME UNDER HIS PILLOW!!
THAT WOULD BE O.K. WITH THE OFFICE..

13
CHRIST ALMIGHTY! GET RID OF THIS HAIR!!
I DON'T KNOW.. HE SEEMS UPSET..
I'LL LOSE MY JOB..
14
SLAM
15
LIGHTNING BURNED MY HAIR OFF ?
JESUS BURNED YOUR HAIR OFF!! YOU JUST COULDN'T BE COOL ABOUT THIS SO WE HAD A BLESSED MIRACLE!!
WHOOPS!!
16
JESUS.. HE HEARD YOUR COMPLAINTS! HE KNEW YOUR GRIPING WOULD COST PUBER HIS JOB.. AND JESUS WAS A WORKING MAN.. HE KNOWS HOW TOUGH IT IS TO FIND A JOB..
WE ARE LEAVING..
TO SAVE A PUBER FAIRY'S JOB.. HE STRIKES ME WITH LIGHTNING..?
AND BURNED MY HAIR OFF.
17
..WE KNOW WHEN WE'RE NOT APPRECIATED!!
HEAR HEAR..
..WHICH WAS MY PERSONAL GROWTH..
THAT MYCHED..
NEAT..
18
NOW WHY CAN'T I SOLVE PROBLEMS THAT EASILY..??

McClane's New Standard Fishing Encyclopedia & International Angling Guide

This is an epic work, and to my knowledge it is the most comprehensive, all-encompassing fishing book available on this planet. A.J. McClane is the executive editor of **Field and Stream** *magazine, a writer with exceptional wit and style and, without doubt, one of the top authorities on angling in the world today . . . but no one person alone could have written this book. Its scope is too vast and its level of expertise too profound. A.J. has sounded the ramshorn and amassed a formidable array of heavies representing the entire angling spectrum and the result is an extremely impressive and solid work, for the first time, a true anglers' bible.*

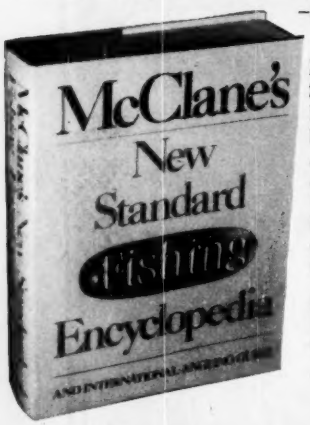
This isn't the kind of book you read while hanging onto a subway strap. It's as thick as a butcher's block and the weight is commensurate. There are hundreds and hundreds of color photos and illustrations. The total number must run into several thousand. There are more than 6,000 entries covering nearly 1,500 species of fresh and saltwater fish. There are drawings, charts, diagrams, step by step lessons on how to procure the finny beauties — also how to cook, clean, smoke and mount them. . . . There are major articles on such things as algae, insects, diseases and parasites, rod building, flies and fly tying and currents.

If that isn't enough, the international angling guide puts you onto the hot spots in all fifty states, Canada, Central and South America, Europe, Asia, Africa, Australia, Iceland, the Pacific, the Atlantic, etc., etc., etc.

Obviously it would make a superb gift for any fisherperson, but beyond that, it would serve as a unique and invaluable reference in any library. Don't let the forty dollar price tag throw you, this is something you can give your grandkids.

Fishing has been one of mankind's most elemental and necessary pursuits for well over a half million years, and McClane's book is the best single-volume elucidation yet.

—Sheridan Anderson



McClane's New Standard Fishing Encyclopedia and International Angling Guide
A.J. McClane, Editor
1965, 1974; 1156 pp.
$40.00 postpaid
from:
Holt, Rinehart, & Winston, Inc.
383 Madison Ave.
New York, NY 10017
or Whole Earth

Malangsfossen

This is considered the finest single salmon pool in the world. It is almost 250 miles north of the Arctic Circle in a valley of dense pines and spectacular mountains. Its excellence stems from the size of the river and its thundering waterfall, which churns through 500 yards of broken boulders and mossy ledges until it has dropped almost 75 feet into the pool. The falls block the entire spawning run of a major arctic watershed for almost two months. Sometimes thousands of salmon, darkening after weeks in the river and others still sea-bright and fresh, lie waiting in its tumbling currents until the right water level enables them to ascend the ladder in the falls; this usually occurs in early July.

Sherpa Snowshoes

Know what porcupines eat in the summer? Stored snowshoes, that's what. Unless they happen to be one of the newer designs such as these. In addition to being unpalatable to rodents, these snowshoes are unaffected by water and ice, they require no annual varnishing or other maintenance, and they don't loosen as you plod down the trail. Their exceptionally light weight makes them easy to carry and also tends to prevent the dreaded "Mal d' Raquette." These people are not the only ones making modern snowshoes, but they have a very good reputation. Their products are a good example of modern materials and design making the old way seem a bit silly except as a nostalgic handcraft.

I'll concede that these are more energy-intensive to make, but on the other foot, they are less labor intensive to use. Where you draw that line may not be so obvious until you've spent some miles on the trail. After 20 miles, esthetics and philosophy seem to defer to functional elegance. As usual. They are not cheap.

—J. Baldwin

Sherpa Snowshoe Products
Catalog
from:
Sherpa Design, Inc.
3109 Brookdale Rd. E.
Tacoma, WA 98446

Featherweight — when fitted with a SHERPA traction binding, this snowshoe is the choice of coast state mountain climbers. The light weight and maneuverability factors outweigh the obvious lesser flotation factor in their choice.

Being light, strong and compact, the Featherweight is ideal for survival and emergency use. In all areas it's the choice for the variable snow cover of the late spring and early fall. 8" x 25" with 2-3/4" turn-up. Wt. 2 lb., 6 oz. $36.

Polarguard is fine

I greatly disagree with the sentiments expressed last issue by a reader that the synthetic fillers aren't so good after all. But one should keep in mind, Polarguard at this time seems to be clearly superior to other brands, so stories of synthetic filler trouble should be branded. Polarguard can be permanently injured by stuffing it tight in its sack and leaving it there as storage. This is especially true in hot weather, and is also a shortcoming of down. I should like to add that Polarguard is exceptionally easy to sew do-it-yourself, especially compared to down which tends to be Feather City in your living room by the time you're done. I have yet to witness any sort of Polarguard failure, and I like it better the more I use it.

As to Snow Lion, well a recent look at what's on the local rack appears to me to be way above average in quality. There are rumours concerning exploitive labor practices at Snow Lion. I don't know if they're true or not. If that's important to you, check it out before buying from them.

—J. Baldwin

The Improved Clinch Knot has many applications in tying flies, lures, bait hooks, and swivels to leader or line, or to tie a line to a reel spool.

Occasionally, prior to death, an octopus will eat its own arms.

Communications

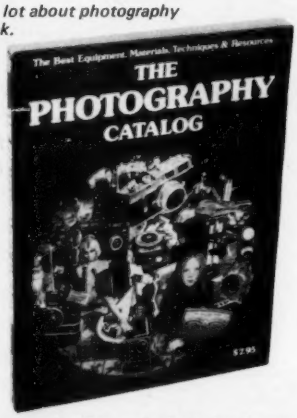
The Photography Catalog

I'm impressed.

The field of photography has so much stuff and it changes so rapidly that I've always despaired of doing an adequate access-and-evaluation job on it even though it was once my profession. Fortunately Norman Snyder did not despair, and the result is the best improvement on the Whole Earth Catalog *format that I've seen. I hope he keeps it updated and in print.*

You can learn a hell of a lot about photography just browsing in this book.

—SB



The Photography Catalog
Norman Snyder, Editor
1976; 256 pp.
$7.95 postpaid
from:
Harper & Row General Books
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth

Use Your Head

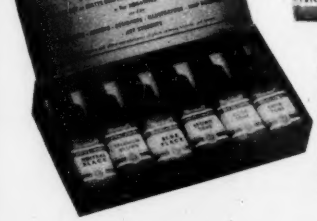
With a pair of adjustable vise-grip pliers and a Leitz head, you can make an immensely versatile clamp that is ideal for cramped or unusual quarters. Use a carbide bit to drill into one arm of the pliers. Insert a 1/4 inch X 20 bolt and screw the head onto the pliers. Now, you can clamp a camera or light source in awkward situations, since the vise-grip will tighten around practically anything. One photographer used this device to secure a motorized Nikon onto motorcycle handlebars. Though the bike scrambled over some rough terrain, the pliers held, and he got some dramatic shots.

•

From Dust We Come, With Dust We Live

Unless you photograph, develop and print in a room designed for the assembly of missile computers, you can count on winding up with white specs on your prints from dust that has settled on or embedded itself into the negative. Fight the dust . . . then learn to spot. Use a magnifying glass; any clean paper used to lean on to protect the print from skin oil and dirt and a good No. 00 or No.000 red sable artist's brush, twirled on the tongue to keep it pointed. Special dyes, shown below, are mixed in to match the image tone of each particular brand of paper. Hint — after mixing the dye, combine it with a water puddle on a 4 x 5-inch (11 x 13 cm) glass plate. When it's dry, you will have various densities of dye available to lift off the plate with a tongue-moistened brush. Build up the image SLOWLY by stippling, not by painting. Beginners always go too far.

Photographic spotting dyes penetrate completely into the print emulsion, leaving no surface residue. Always use a dye dilution that is *lighter* than



the area to be matched; it can always be made darker by successive applications. Retouch Methods, Inc., makes a kit of five different "Spotone" black dyes; Marshalls' Spot-All set is identical. Kit directions indicate mixing proportions for various papers, toned and untoned.

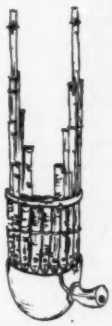
House of Musical Traditions

Amazing variety, looks like good prices. Will some customers tell us about their service and quality?

Sitars, kotos, lutes, dulcimers, tablas, dhaps, gongs, drums, cymbals, nose flutes, slap sticks, and books.

—SB

House of Musical Traditions
(Catalog)
Free
from:
House of Musical Traditions
305 S. Washington St.
Berkeley Springs, WV 25411



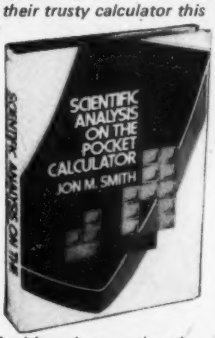
CHINESE SHENG. The ancestor of the modern harmonica which is attributed to Emperor Huang Tu' who some 4500 years ago used 5 bamboo tubes, each holding a different sized reed, to produce a pentatonic scale. Designed to resemble the tail feathers of a Phoenix, the modern sheng is 18 inches long with 17 tubes that sound when the corresponding hole above the reed is closed. $100.

Scientific Analysis on the Pocket Calculator

When I'm working on an application involving really serious "number crunching" (any highly mathematical use of a computer), I almost invariably consult Richard Hamming's 1962 classic Numerical Methods for Scientists and Engineers, *sometimes just for inspiration. Jon Smith has recast Hamming's computer-oriented methods into forms more suitable for implementation on a pocket calculator and has included substantial material covering additional topics.*

Careful attention was paid to making the book as useful as possible to a wide spectrum of users — algorithms are designed to minimize keystrokes to reduce error and fatigue and are given in both algebraic and reverse polish notations. Most of the methods work on even the simplest of calculators but variations and ramifications for more sophisticated models are also treated. For those about to take on some of the heavy stuff armed only with their trusty calculator this well-written, well-designed book is a definitive ally.

—Marc Le Brun
[Suggested by W. James]



Scientific Analysis on the Pocket Calculator
Jon M. Smith
1975; 380 pp.
$12.95 postpaid
from:
John Wiley & Sons, Inc.
One Wiley Dr.
Somerset, NJ 08873
or Whole Earth

It is the nesting of a sequence of arithmetic operations in parenthetical form that is the basis for performing advanced analysis on the pocket calculator. For example, 14 multiples, 2 divides, 2 sums, and 108 data entries, totaling 126 key strokes and 5 data storage records, are needed for a three-digit floating-point evaluation of sin (x) $x - x^3/3! + x^5/5!$. But only 54 key strokes and *no data storage records* (on a scratch pad) are needed to evaluate sin (x) $x(1-(x^2/6)(1-x^2/20))$ to the same accuracy. Though we would evaluate sin (x) in this manner only on a four-function calculator, this example does illustrate the point that many complex formulas usually requiring calculator memory to be numerically evaluated can be written in a "nested" form not requiring calculator memory and thus can be evaluated conveniently on even the simplest four-function pocket calculator.

Learning

How to Learn Things: A Handy Tip

If you're starting to learn about a field that you know nothing about or even less, go to the children's library and get some fifth, sixth, seventh grade books about it before you go into grownup books. Basic books for grownups tend to be aimed at college freshmen taking required courses – and everybody knows they're supposed to suffer, including the people who write the books. Basic books for kids are aimed at kids browsing in libraries who don't have to be there and could leave anytime. The books have colors and pictures and a will to sell the subject; the good ones assume you know nothing without being even a little bit condescending. You can get some vocabulary and feel for the shape of the subject before you get into the stuck-up real books. Kids books can also help you if you are one of those freshmen in one of those required courses.

–Anne Herbert
Columbus, Ohio

The two series of kids books that are the very best for this use are Golden Books (with Golden Press Division, Western Publishing Co., Inc., 1220 Mound Ave., Racine, WI 53404) and the Ladybird Series from England (write Ladybird Books, Ltd., Loughborough, Leicestershire, England). Two libraries worth buying complete to have around a house with children.

–SB

The Nature Company

A very fine assortment of gentle tools for natural history – binoculars, magnifiers, bird feeders, weather instruments, sundials, good books, kits, etc.

–SB

The Nature Company
Catalog
Free

from:
The Nature Company
(Mail Order Dept.)
1999 El Dorado
Berkeley, CA 94707

Spectrarc™ Window Prism. Nothing short of color photography can describe accurately the beauty and effect of this combination sculpture/mobile and prism. It is a unique, hand-cast optical instrument, incorporating the properties of a prism in its long 12" curved triangular bar to transform light into rainbow colors; and the principles of lenses to shape and focus the resulting spectrum. An adjustable method of suspension lets you change the direction and configuration of the spectrum projected on nearby surfaces. Each Spectrarc is tinted in either blue or red for aesthetic purposes. Each will produce a full color spectrum, with a very slight emphasis toward the tinted color.
0212 Spectrarc™. Specify Red or Blue. $16.00

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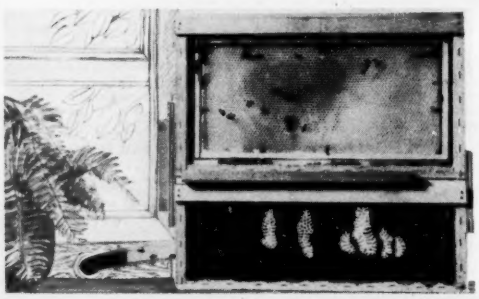

COMBINATION OBSERVATION/PRODUCTION BEE HIVE

Bring the fascination of beekeeping and the harvesting of pure honey right into your house with this totally unique observation and production hive. Its uniqueness lies in the provision of accessible storage space in which the bees can put the honey, plus a completely safe observation system that enables you to have the hive indoors.

Bees gain access through a short, flexible tube that is put through a hole in a window slat or wall (the hole should be located where it will not be in the path of people coming and going from the building). Honey storage is in the detachable upper section, from which the bees can be excluded at any time for purposes of harvesting. Cabinets are of unfinished pine, with clear plastic windows.

Once the hive is started (by taking it to a local beekeeper, who will fill it with workers and a queen), it will continue for years providing honey (up to 30 pounds a year!) and lots of fascination. It can be placed on a table or mounted on a wall. Wherever it is put, people will gather to watch the show!

Please note: The Nature Comapny does not provide bees for these hives. Consult your Yellow Pages under "Bee Keepers" to ascertain whether a source of bees exists in your area. Costs of starter sets vary, but should be about $25. The combination hive costs $50.

Business

Statement of Ownership, Management and Circulation

(Required by 39 U.S.C. 3685)

U.S. POSTAL SERVICE

1. Title of Publication: The CoEvolution Quarterly.
2. Date of Filing: 9-28-76.
3. Frequency of Issue: Quarterly (every 3 months).

3a. No. of Issues Published Annually: 4 (four).

3b. Annual Subscription Price: $8.00.

4. Location of Known Office of Publication: 27 Gate 5 Road, Sausalito, Marin Co., California 94965.
5. Location of the Headquarters or General Business Offices of the Publishers: 27 Gate 5 Road, Sausalito, Marin Co., California 94965.
6. Names and Complete Addresses of Publisher, Editor, and Managing Editor:

Publisher: POINT, Box 428, Sausalito, CA 94965
Editor: Stewart Brand, Box 428, Sausalito, CA 94965
Managing Editor: same as Editor.

7. Owner: POINT, a California non-profit corporation, Box 428, Sausalito, CA 94965.
8. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities: None.
9. The Purpose, Function, and Nonprofit Status of This Organization and the Exempt Status for Federal Income Tax Purposes Have Not Changed During Preceding Twelve Months.

10. Extent and Nature of Circulation:

	Average No. Copies Each Issue During Preceding 12 Months	Actual Number of Copies of Single Issue Published Nearest to Filing Date (as of filing date)
A. Total No. Copies Printed (Net Press Run)	28,000	34,000
B. Paid Circulation		
1. Sales through dealers and carriers, street vendors and counter sales	10,500	14,000
2. Mail subscriptions	9,250	13,000
C. Total Paid Circulation (Sum of 10B1 and 10B2)	19,750	27,000
D. Free Distribution by Mail, Carrier or Other Means Samples, Complimentary, and Other Free Copies	0	0
E. Total Distribution (Sum of C and D)	19,750	27,000
F. Copies Not Distributed		
1. Office use, left over, unaccounted, spoiled after printing	5,625	3,500
2. Returns from news agents	2,625	3,500
G. Total (Sum of E, F1 and 2 — should equal net press run shown in A)	28,000	34,000

11. I certify that the statements made by me above are correct and complete.

(Signature) Andrea Sharp, Business Manager

Thank you

Maniacal Subscribers ($1000)

Greg and Pat Williams
Dayton, OH

Sustaining Subscribers ($100)

A. Reid Bishop
Switzerland
Kay Bogart
Corvallis, OR
Mrs. Arthur Brand
Rockford, IL
Marlon Brando*
Tahiti
Edmund G. Brown, Jr.*
Sacramento, CA
Nicholas Dawson
Nottingham, NH
L.J. Endicott
Switzerland
Hal Heisler
Los Angeles, CA
Ray Lefebre
Baton Rouge, LA
Jane B. Lehman
Belvedere, CA
Bob McMahon
Ventura, CA
Jim O'Hair
Indianapolis, IN
Roy Rappaport
Ann Arbor, MI
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Miami, FL
Audrey Sabol
Villanova, PA
Robert Schuler
High Falls, NY
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Calgary, Canada
Jean C. Talpin
Pescadero, CA
Allen V. Tough
Toronto, Canada
Bruce Umbarger
Lansing, MI
Roderick van Buskirk
Stanford, CA
Viki Zelman
Villanova, PA

**By virtue of returning payment for interview.*

The Retaining Subscriber list includes only those who became retainers since the last issue. A glance at the financial report will show how indebted we are to our contributors.

Retaining and Sustaining Subscribers get their magazine delivered first class (airmail) for a year. Maniacal Subscribers get **The CQ** *for life. Each of the donation amounts (minus $8) is tax deductible.*

Retaining Subscribers ($25)

John Bailey
Lancaster, MA
Joe Eddy Brown
Glen Ellyn, IL
Herbert Bryant, Jr.
Tampa, FL
Gregg Bulsford
Anchorage, AK
Francis Cooke
Lexington, MA
Thomas Christ
Toano, VA
Will Christ
Maryville, MO
Jim Chubb
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Hal Dygert
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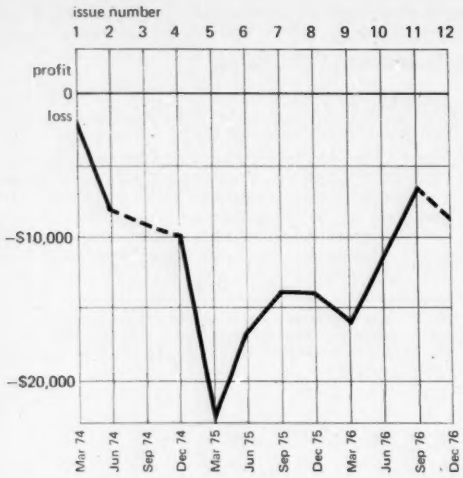
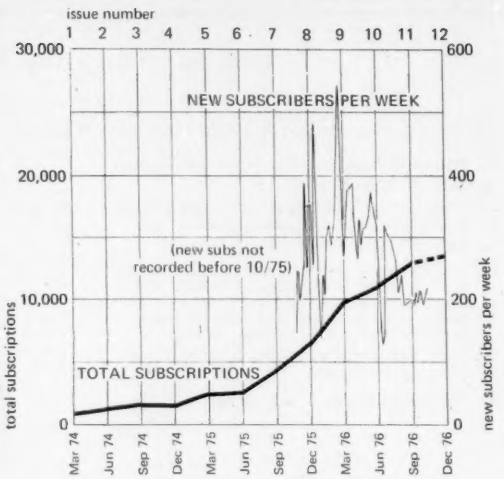
Menlo Park, CA
Tom Terrific
Berwyn, PA
Taj VonBarnkow
Albany, CA
John Walker
Mill Valley, CA
Ken Wedding
Minneapolis, MN
Jean Wood
Spokane, WA

and Seven Anonymous

Profit/loss per issue



Subscription history, per issue



The graph on the left portrays our "profit" (there is none) and loss in terms of dollars per issue.

The graph on the right portrays two things. On its left, we show the total number of active subscribers per issue. On its right, we show the number of new subscriptions we receive per week. The reason these two figures are separate phenomenon is that in terms of our total growth, we lose people who don't renew at the same time that we gain new subscribers. This means we can have a strong issue in terms of new subscriptions, but our total active subscribers could go down if our renewal rate is low. In fact, this is the situation we are now experiencing. The dotted lines represent projections – they seem to be headed downward, but this can (and we hope it will) change.

Big financial news at CQ

Small financial news, actually.

Not immediately but in due course the continuation of the magazine is in jeopardy. The reason: insufficient subscribers. The reason in more detail: insufficient renewals (below 40% currently – the best in the business is the 75% of the New Yorker*). Until recently we had over 50% renewals.*

Paradoxically, reader response via letters and conversation has never been so positive, so if we're doing something wrong in the magazine it's hard to tell what it is. Consider this a request for specifics from any of you departing subscribers – though I realize that ones who leave angrily tend to write more often than ones who leave mildly.

Most magazines are either in trouble or close to trouble financially, and most are careful not to discuss it in their pages lest their skittish subscribers spook entirely. We've been discussing it from the beginning (it's a sort of interesting subject) partly because we've had enough money left over from the Whole Earth Catalog *to carry us in our search for the 25,000 or so subscribers it will take for the* CQ *to break even.*

Current active subscribers are about 12,000, and the Whole Earth Catalog *money is running low – down to around $30,000. That includes expected income from sales of the remaining* Catalogs *in print – we're not reprinting another edition but keeping the money this time. $30,000 pays for about another three issues of* CQ *at current loss rates. I've seen a lot of pretty good magazines appear, strut, and disappear. It's galling to think of joining that sad lot. Most magazines are showy and brief – weeds. We'd rather be a tree.*

Brave words, but if the seed is imperfect or the ground infertile, better that the harsh marketplace kill the thing and restore its elements to the soil for recombining in other life. A sickly magazine is a pain to be around.

Frankly, this one is a joy to be around – inside at least – and we aim to maintain it. If that's impossible, so what? All the more reason to try. So – there's the cards, the game, and the stakes – all that's worth talking about now is how to play out the hand. I see three major tactics.

1. SIMPLY CONTINUE

The leveling of subscriber growth might be an anomaly – it could climb again with as little apparent reason as it slowed.

We might get lucky and find ourself praised in some national medium. A piece we carry might break out to public consciousness as being Very Important. [Ron Jones' account of The Third Wave did that, but for reasons we're still grinding our teeth over the wire services reported that article as appearing in Learning *magazine – which it did, in reprint from* CQ*.]*

In any case continue means continue. Contributors and people who work here get paid on schedule (except me – I'm on account, with interest). We don't go through the todentanz of dying magazines – switching editors, cover styles, formulas, campaigns. If this magazine dies or lives let it be with sureness and dignity. It sure as hell can't live agitated.

Reader-participants in The CQ *can help the CONTINUE tactic by sending us superb articles, reviews, suggestions: content. I'm repeatedly amazed at how much of our best stuff comes in by itself. It is the quality of the readership that sustains this enterprise.*

2. PAUSE FOR ANOTHER CATALOG

We could send subscribers a brief quarterly newsletter for a year while we prepare for them and everyone else a whole new compendium of every item that's proved its excellence in the Whole Earth Catalog, Epilog, *and twelve issues of* The CoEvolution Quarterly: WHOLE EARTH CATALOG - 1978 *– 500 pages, $10 (free to the subscribers).*

Books sometimes make money; magazines seldom do. A successful new Catalog *might pay for many years of a continued* CQ *which could lose money with aplomb. An*

CoEvolution Quarterly — Winter '76/77 financial report

EXPENSES

	Aug.,Sept.,Oct. (Predicted)	Aug.,Sept.,Oct. (Actual)	Nov.,Dec.,Jan. (Prediction)
Salaries and fees			
Office	$ 9,000.00	$11,506.00	$13,500.00
Production	5,400.00	4,254.00	5,000.00
Editors	9,900.00	9,628.00	9,900.00
Contributors	4,800.00	3,707.00	4,500.00
Office rental, materials, etc.	7,000.00	6,090.24	7,000.00
Phone	1,300.00	1,264.17	1,300.00
Promotion	5,300.00	756.48	6,630.00
Printing	16,000.00 (34,000 copies)	16,451.24 (34,000 copies)	16,000.00 (34,000 copies)
Subscription process and mail	3,000.00	6,980.92	7,000.00
Shipping	670.00	960.13	970.00
Business reply	500.00	1,197.42	1,000.00
Refunds	50.00	465.10	200.00
Total	$62,920.00	$63,260.70	$73,000.00

INCOME

Subscriptions, gifts and renewals	$39,000.00	$39,160.57	$49,000.00*
Retaining and Sustaining	1,000.00	3,225.00	2,000.00
Back issues	7,000.00	5,663.95	5,200.00
Distribution	11,500.00	8,443.40	9,000.00
Total	$58,500.00	$56,492.92	$64,200.00
NET LOSS	($ 4,420.00)	($ 6,767.78)	($ 8,800.00)

*This number reflects a one-time increase of $11,500.00 due to Xmas gifts.

unsuccessful new Catalog *would decisively crash the business in flames — not a bad way to go.*

But, o, the labor. I'd emphatically rather stick with the magazine. It can try things a catalog can't. And there's material coming I want to print — chapters from Wendell Berry's work-in-progress on agriculture, articles by whale scientist Roger Payne on creative environmental booby-trapping and Why Everything Bad is Rewarded, etc., etc.

3. BEG

So far we have avoided hitting up foundations for money to maintain the magazine. I've preferred to work outdoors in the weather of the market — subjected to what E.F. Schumacher calls "commercial discipline."

Still, POINT itself is a foundation, charitable as well as educational. We gave away over a million dollars between 1971 and 1973 in ways sufficiently peculiar to have influence on the mainstream of American foundations. A return from them might not be inappropriate.

A foundation or set of foundations could maintain The CoEvolution Quarterly *in business for about $40,000 a year while we continue to shoot for commercial success so we can get off the dole.*

Honored Sirs and Ladies, consider this a proposal. With your help we might even be able to afford the page space to use larger print, 10 point instead of the 8 point you see here.

SO HERE'S THE PLAY. We are inviting patronage.

We are methodically doing the next issue of The CQ *(Spring '77) with unperturbed attention to detail. Good stuff is in hand for Spring, especially on How to Run the Arms Race Backwards.*

We will watch like hungry hawks our commercial indicators and, if they fail, do another catalog.

In any event the subscriber won't be shorted. Your $8 gets you either what you paid for, or more.

—SB

Definitive fanmail

Dear CoEvolution Quarterly People,

This is a fan letter.

I am splurging for my birthday and giving myself a subscription to CQ. I'm even buying a few back issues and the Catalog. I wish I was rich enough to be a maniacal subscriber, or at least send out a bunch of gift subscriptions. I'm not, so I figured the least I could do is write some appreciation.

I only discovered CQ a few weeks ago. Since then, I've been reading every issue I could get hold of. It is wonderful! I am put through such a variety of sensation by your articles. First I may find myself almost understanding something — as though the pattern were just on the tip of my mind. Another subject makes me feel like the world is my responsibility. I am am frustrated and then enlightened. I laugh and then I find myself all still with wonder. Always it is an adventure, always an opening up. Fabulous, fabulous. I can barely handle all the information and magic — and I'm sure I'm not getting even a fifth of what is there. How do you do it?

The quality which really excites me about CQ is the way all of your personalities and enthusiasm comes through. It is wonderful to feel as though I know the people who are making this happen; it makes me feel that I can run out and do everything that I care for. Thank you so much!

Love,

Jaida n'ha Sandra
Berkeley, California

We greatly appreciate supportive letters like this. A lot of them come here and they make a difference. Because most magazines print such letters, however, we don't. General approval is less informative for the reader usually than specific debate, which we're likelier to print and pay for. Debate is a service. Praise is a pure gift.

—SB

Gossip

More personnel changes going on. George Keenan is leaving (another drunken farewell party) to do some travelling — for self-broadening, not because handling the complaint mail got him down. (A note on that — please do let us know when there's any problem with your subscription. And thank you for complaining gently.)

George is replaced by Ben Campbell, 28, whose qualifications include having worked for the Whole Earth Truck Store for a year and as an aide in a North Carolina psychiatric unit for three years.

Several of us have been having adventures elsewhere in California. Andrew Main describes life at Tassajara Zen Mountain Center as "impossible but not difficult." His day goes:

3:40 a.m. wakeup
4:00 zazen
4:40 kinhin (walking meditation for break)
4:50 zazen
5:30 service (bowing & chanting)
6:00 breakfast (eaten in zendo by formal ritual - each student has a set of bowls, spoon, chopstix, cloths)
6:50 study (reading related to Buddhism)
8:20 zazen or lecture
9:00 break
9:30 work meeting
11:25 end work
11:50 service
12:00 lunch (in zendo)
12:50 break
1:30 work meeting
3:15 tea, & back to work
4:45 bath (Tassajara hot springs)
5:30 service
5:40 supper (zendo) — 6:20
6:20 break
7:30 zazen
8:10 kinhin
8:20 zazen (5 periods of zazen daily, plus meals — ca. 5 hrs.)
9:00 bedtime
9:30 lights out

Schedule varies on different days — 4 & 9 days (4, 9, 14, 19, 24, 29) are "days off" — free time from 9 a.m. to 5 p.m. — sleeping, laundry, sewing, hikes, letters, etc. — long hot baths!

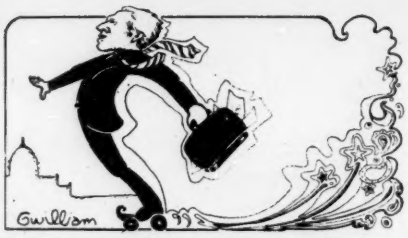
As for my merely two-month sabbatical to Sacramento working for Governor Brown as temporary full-time consultant, it is, to use the commonest word you hear in the Governor's office, "interesting." (The second most common word is "poohbah" — referring to anyone with rank in anything and the need for respect for that but not too much.)

The most frequent questions I get are: How do you like Sacramento? (I'm thoroughly enjoying it); What do you do all day? (Talk on the phone and meet); What's Governor Brown like? (A good man and a good wizard). The warm ambiance of the Governor's Office — the quadrangle of corridors on the first floor of the Capitol — I think has never been reported. It's California-friendliness squared. Everyone is first-name to everyone, especially to secretaries, except Jerry Brown, whose first name is Governor. Hugging is not the routine greeting, but anyone who needs a hug gets one. The place has a camaraderie to match the long hours and frustrating process of managing the unmanageable.

A two-month appointee is not a bad idea for helping that process. As a short-timer you threaten no one, you're in learning mode (and others see their tasks fresh through your eyes), you're free to float to targets of opportunity, and people use your temporariness to get their projects rolling while you're around to help.

As a result I found myself participating in: a State Appropriate Technology Exposition and Trade Fair (next September); Brochure and application forms for the new California Conservation Corps; "California Celebrates the Whale" — a quite successful generically different public event on Nov. 20; a mini-lecture series within the Office called "What's ACTUALLY Going On" — featuring, so far, Orville Schell, Wendell Berry, Rusty Schweickart, Herman Kahn, and Amory Lovins; and various projects too half-finished to mention. The Governor was in the thick of these as well as innumerable other goings-on I never saw.

The role of a politician in a democracy is some combination of businessman and entertainer — show biz, in other words. The press plays a bigger part in this than it may realize. In the Governor's office the closet with the wire-service teletype machines is variously called "The Hall of Mirrors" and, with only partial irony, "The Reality Machine."



Brand in Sacramento as seen by the San Francisco Chronicle: former Merry Prankster "darts in and out of the corridors of power."

One of Jerry Brown's special talents is to keep the political process aware of itself — by referring to the Capitol as a big-people's sandbox where intelligent grownups grab each other's shovel and whap each other with their pail ("That's MY pile of sand!"); by remarking to a reporter that elections remain fundamentally a mystery and to analyze them too deeply is to commit the fallacy of misplaced concreteness; by observing about one grand project, "Our hidden agenda on that one is 'So what?' — if it works, fine, if not, no loss"; and by continually reminding the people who spend government money that it's not their money. Brown's first response to my arrival was to cut my salary by a third (correctly, I thought — from the staff-recommended $3,000 to $2,000 a month).

Sacramento, to me, is Oz — munchkins, witches, wizards, the motley band with Dorothy, and all. There's dazzling magic. You gesture gracefully toward yonder wall, and PHOOM!, spectacular goings-on. Gesture again: PHOOM! over on that side. Gesture again: nothing happens. Gesture repeatedly: nothing happens. Turn your back: PHOOM!

As Jimmy Breslin said of politics, "It's all done with mirrors and smoke."

What isn't? —SB

The CoEVOLUTION Quarterly

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Editor Stewart Brand
Research Traffic & Accounting Andrea Sharp
Production Manager & Paste-up Diana Fairbanks
Distribution, Promotion, & Library Jeanne Campbell
Subscriptions & Back Issues Mike Young, George Keenan, Isabella Kirkland, Ben Campbell
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Craft Evaluations Diana Sloat
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Illustrations Tom Parker, Jay Kinney, Chong Lee (prints), Jon Goodchild, Ilka Hartmann
Business Advisor Andrew Fluegelman
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Printing Fricke-Parks Press, Fremont (body)
Hatcher Trade Press, San Carlos (cover)
Recorder Sunset Press, San Francisco (bindery)
Glue-Fold Co., Menlo Park (envelopes)

Order Form

The lefthand column of boxes is for checking items to be sent to your address. The columns on the right are for gifts and correspond to the numbers below. Subscriptions will begin with the current issue unless otherwise noted.

Self			Gifts 1	2	3	4	5	6
☐	$8	____ subscriptions: One year of **The CoEvolution Quarterly** (4 issues)	☐	☐	☐	☐	☐	☐
☐	$16	____ subscriptions: Two years of **The CoEvolution Quarterly** (8 issues)	☐	☐	☐	☐	☐	☐
		Starting: ☐ Winter 1976 ☐ Spring 1977						
☐	$2	____ copies: The following back issues (contents overleaf)	☐	☐	☐	☐	☐	☐
☐	$3	____ copies: Map of WORLD BIOGEOGRAPHICAL PROVINCES	☐	☐	☐	☐	☐	☐
☐	$4	____ copies: Poster of "CoEvolution Face"	☐	☐	☐	☐	☐	☐
☐	$2	____ sets: Ten postcards of "CoEvolution Face"	☐	☐	☐	☐	☐	☐
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☐	$2	____ sets: Ten postcards of "CoEvolution Sky"	☐	☐	☐	☐	☐	☐
☐	$6	____ copies: WHOLE EARTH CATALOG	☐	☐	☐	☐	☐	☐
☐	$4	____ copies: WHOLE EARTH EPILOG	☐	☐	☐	☐	☐	☐
☐	$25	I would like to be a Retaining Subscriber.						
☐	$100	I would like to be a Sustaining Subscriber.						
☐	$1000	I would like to be a Maniacal Subscriber.						

$ _____ total enclosed

The CoEvolution Quarterly
Box 428
Sausalito, California 94965

My Name: _____

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Zip _____

6121

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Back Issues

Issue No. 1, Spring 1974, is out of print.

No. 2, Summer 1974

Setting Food By *Doris Herrick*
Ehrlich's Guide to the Apocalypse: Food *Anne H. Ehrlich and Paul R. Ehrlich*
Sanctity and Adaptation *Roy A. Rappaport*
Land Banking *Huey Johnson*
Gravity Engines and the Diving Engine *Steve Baer*
New Games Tournament *Pat Farrington*
Salons and Their Keepers *Stephanie Mills*
Notes on Provisioning a Small Boat for Extended Cruising *Kathleen Pumphrey*
Apple Picking *Rick Fields*
Bookmaking Access *Robin Rycraft*
Making and Playing the Shakuhachi *Monty H. Levenson*
Gorf *Michael McClure*

No. 3, Fall 1974

Edited by the Black Panther Party *Huey P. Newton, Elaine Brown, Ericka Higgins, David DuBois*

No. 4, Winter 1974

"The whole system is out of whack" *Dale Jorgenson*
Energetics' Shortcomings *Hazel Henderson*
Enough Energy for Life & The Next Transformation of Man *Lewis Mumford*
The Creature and its Creations *Gregory Bateson*
This Superfluity of Naughtiness *Warren McCulloch*
"Where!?" *Carl Sagan*
Metric System Con *Steve Baer*
A Canadian Home, 1973 *Robert Frank*
Lunaception *Louise Lacey*
To South America *Lynn Meisch*
The Great Gaming-House *Kelly Yeaton*
The Entire History of Man *my*
Dharma Taking Root in the (south) West *Zim*

No. 5, Spring 1975

2025, If . . . *R. Buckminster Fuller*
Energy Choices *Medard Gabel*
Getting Specific for a Porpoise *Eugenia McNaughton*
Sociobiology *Gina Bari Kolata*
The Culture of Agriculture *Wendell Berry*
The Preservation of Old Buildings *Wendell Berry*
Energy Stories *Steve Baer*
Nitinol: Torque of the Town *Fred Gardner*
One Highly-Evolved Toolbox *J. Baldwin*
Jerusalem: Innerviews *S.N. Durkee*
Jack and the Monster *Gurney Norman*
Sesshin Lecture *Zentatsu Baker-Roshi*
The Posthumous Journey of the Soul—Myth & Science *Stanislav Grof, M.D. and Joan Halifax-Grof, Ph.D.*

No. 6, Summer 1975

What Do We Use for Lifeboats When the Ship Goes Down? *my*
Living on a Lifeboat *Garrett Hardin*
The Atmosphere as Circulatory System of the Biosphere—The Gaia Hypothesis *Lynn Margulis and James E. Lovelock*
Who's Earth *Russell Schweickart*
Perspectives in Ecological Theory *Ramon Margalef*
Seed Clouds, Reap Havoc *Patrick Porgens and James R. Bukey*
Sinsemilla Marijuana *Otto Peep*
Making Stone Arrowheads & Scrapers *Gil Verde*
Condoms, These Days *Salli Rasberry and Laird Sutton*
Relative Poverty and Frugality *Paolo Soleri*
"Reality" and Redundancy *Gregory Bateson*
The Human Use of Inhuman Machines *Dave Caulkins*
Advice for the Computer-Lorn, or, Getting Yourself a Computer *Dick Rubenstein*
The Structure of Mystical Experience *Brother David Steindl-Rast*
Ritual . . . *Roy A. Rappaport*
Blessing Way Ceremony, Puberty Rite *Maud Oakes*

No. 7, Fall 1975

The High Frontier *Gerard O'Neill*
Testimony *Gerard O'Neill*
"Is the surface of a planet really the right place for an expanding technological civilization?" *interviewing Gerard O'Neill*
Deep Space Material Sources *Eric Drexler*
Caring and Clarity *conversation with Gregory Bateson and Edmund G. Brown, Governor of California*
Systems, Economics, and "Female" *Hazel Henderson*
Working in China *Orville Schell*
The Difference Between Unity and Uniformity *E.F. Schumacher*
Schumacher's Buddhism *Peter Gillingham*
From Field Guide to Western Oregon *David Schetzline*
Gay Access *Richard Hall and Dan Allen*
The Reactive Engine Paper *Terry Winograd*
From the Command Center: The Mayaguez Incident *Brigadier General Donald Sampson on the phone*
Gathering Challenge to Fiat Money *Carter Henderson*

No. 8, Winter 1975

Local Dependency *Stewart Brand*
The Clothesline Paradox *Steve Baer*
What's Left? Revisiting the Revolution *Jay Kinney*
The Ohu Movement in New Zealand *Elliott Smith*
Nonviolent Direct Action Is Alive and Well in Europe *Lee Swenson*
Poems *Richard Brautigan*
A Guide to Horse Equipment *Jack Carroll*
Marlon Brando Plans a Whole Earth TV Special *conversation with J. Baldwin and Stewart Brand*
Confessions of an Ex-Blackjack Player *Rolf Cahn*
Homestead Bicycle Technology *Jim Burgel*
Access to Synthesizers *J.D. Sharp and Mark Garetz*
The Further Adventures of Huckleberry Finn *Baine Kerr*
A Brief Memoir *Anne Waldman*
Ancient Creek *Gurney Norman*
Interview with a Cattle Mutilator *Paul Krassner*
Sporting Deaths *Russell D. Chatham*
The Optimist *Don Carpenter*
An Abridged Collection of Interdisciplinary Laws *Conrad Schneiker*

No. 9, Spring 1976

Is Balance Really Possible Where Even Gravity Is Manufactured? (Comments on O'Neill's Space Colonies)
Space Colonies, Ethics, and People *J. Peter Vajk*
The New Alchemists *John Todd*
More Highly-Evolved Toolbox *J. Baldwin*
Space colonies should stay away from the government for a while *Astronaut Russell Schweickart*
Prayer Breakfast *Gregory Bateson and Gov. Jerry Brown*
Four New Poems *Gary Snyder*
Take As Directed *Ron Jones*

No. 10, Summer 1976

Olbers' Paradox *Lawrence Ferlinghetti*
Jacques Cousteau at NASA Headquarters
On Observing Natural Systems *Francisco Varela*
Carl Ortwin Sauer 1889-1975 *James J. Parsons*
Theme of Plant and Animal Destruction in Economic History *Carl Sauer*
Trees *Jean Giono*
The Hoedads *J.D. Smith*
Some Mice *Robert Horvitz*
The Space Crone *Ursula Le Guin*
Winning *Ron Jones*
The Education of Joni Mitchell
Its our very effort to make reality repeatable which Buddhism calls suffering *Zentatsu Baker-Roshi*

No. 11, Fall 1976

From Present to Future *Herman Kahn with William Brown and Leon Martel*
The Shift from a Market Economy to a Household Economy *Scott Burns*
Future Primitive *Raymond Dasmann*
Biogeographical Provinces *Raymond Dasmann*
Controversy Is Rife On Mars *interviewing Carl Sagan and Lynn Margulis*
Mind/Body Dualism Conference Position Papers
Community Gardening *Rosemary Menninger*
Underground Architecture *Malcolm Wells*
Cross-Generation Marriage *Theodora Kroeber-Quinn*
Earthshoes & Other Remarks *Ken Kesey*
The American Anti-Whaling Movement Is Racist *Michael Phillips*
Boone *Gurney Norman*

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Stewart Brand

The **CQ** *watershed used to drain directly into beautiful salt marsh at the foot of Wolfback Ridge. The marsh was filled to make a four-lane road and provide space for warehouses and deepwater boat mooring. The* **CQ** *office sits on this fill. The headwaters of* **CQ***'s immediate watershed are still intact with willows and oaks. It is surrounded by Anchorage Apartments (city housing), tightly packed redwood "single-family" homes, and a Christian Science Church. The creek is un-named (it parallels Coloma St.) and intermittent (flowing in winter and spring only). The creek enters a cement culvert, travelling under tennis courts and more subdivisions, alongside a field that is flooded because of the raised roadway (which acts as a dam). The field (once marsh) is now used by mini-bikers but used to have a distillery that blew up in the 1950's. After disappearing into the fill, under warehouses, and causing a huge bump in a back street, it appears as the redwood lined aqueduct shown above. This, the mouth of the* **CQ** *watershed, drains storm runoff into Richardson Bay (a sub-bay of San Francisco Bay). We now enter the Pacific. –PW*

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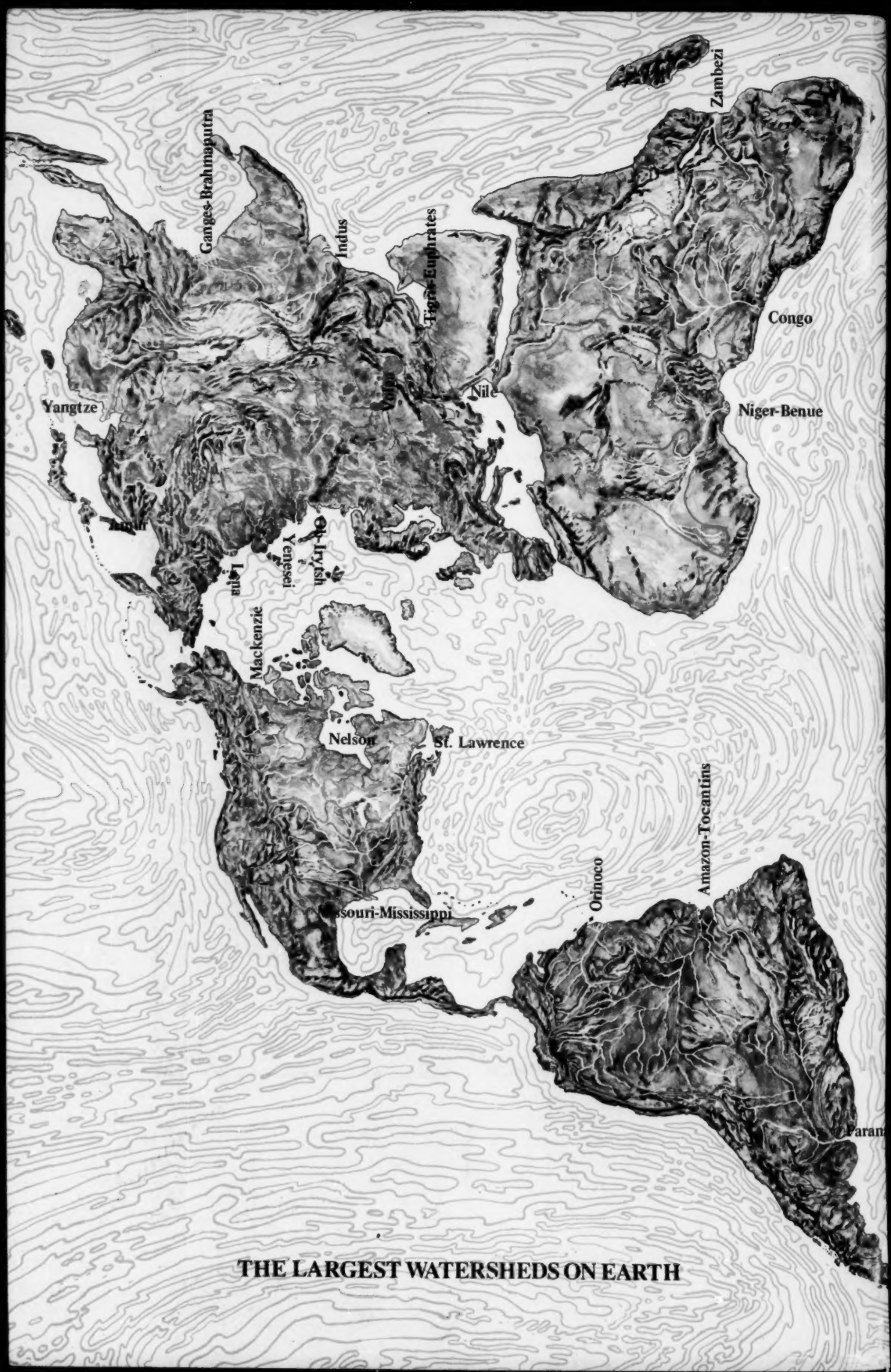
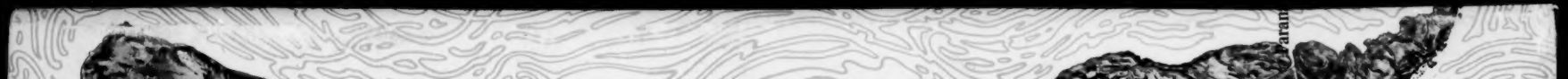
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